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Gives
Horace Greeley

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STEAM ENGINE ECONOMY AND STEAM BOILER ECONOMICS.

A correspondent has been assured, by some one who pretends to have learned the fact (?) from experience, that one half the coal used by a non-condensing engine can be saved by passing one half of the exhaust steam into a heater, and heating the feed to a temperature of 220° Fah., and turning the other half into the ash pit under the boilers. The plan is urged by an engineer (!) who must be either very ignorant or very dishonest, for it conflicts with the teachings of our best scientific authorities and to the practical experience of the foremost men in the engineering profession.

A pound of feed water entering a steam boiler at a temperature of 50° Fah. and evaporating into steam of 60 pounds pressure, requires the addition of as much heat as would be required to raise 1,157½ pounds of water one degree in temperature. Feed water at 220° requires 987½ thermal units. The saving is therefore (1157½—987½)÷1157½, equal to not quite 15 per centum in the case assumed.

To raise the feed water to a temperature of 220° Fah. would require that it be kept under a pressure 2½ pounds per square inch higher than that of the atmosphere, and this would be so much additional back pressure upon the engine.

The best and most practicable pressure and temperature would be at about the pressure of the atmosphere and at as nearly the ordinary boiling point as possible, and even under these conditions, care must be taken to see that the feed pump works under a considerable head or it will be very certain to give trouble. At a temperature of 200° Fah. the economy, as compared with the use of feed at 50°, would be about 13 per cent, and, with a well constructed heater, there should be no trouble from back pressure.

The proposal to convey steam to the furnace, with the expectation that it may be there decomposed, and that its combustible constituent, hydrogen, may yield a large increase of heat by burning with the fuel, while its oxygen will intensify the combustion of the coal or wood, has been frequently made and often tried. The scheme is entirely without scientific basis. The amount of heat developed by the combustion of hydrogen and the chemical union of oxygen is the exact equivalent of the force required to separate them when once united. Consequently, while the combustion of hydrogen in the furnace would yield a great amount of heat, and while the union of oxygen with the fuel itself would develop a large quantity of heat also, the sum of these two amounts would be just equal to the necessary amount of force required to decompose the steam, were these elements obtained as proposed.

Incidentally such use of steam may be useful to a slight extent by causing a more complete transfer of heat to heating surfaces at a distance from the furnace, in rare cases; but even this is doubtful, and neither science nor engineering practice uphold the plan.

The question is also asked whether the experiment referred to, on page 322 of the current volume of the SCIENTIFIC AMERICAN, was correctly described. The experiments referred to were made by M. Donny, a French experimentalist, who published the results of his remarkable research in 1846. (*Annales de chimie et de physique*, third series, No. XVI.) He found that water, deprived of air, could be raised to a temperature of 138° centigrade (280° Fah.) without boiling, and that evaporation then took place explosively, the water discharging a sufficient amount of steam at a single burst to

reduce its temperature to that due the pressure to which it was exposed. M. Deluc observed the fact even earlier than Donny, and many physicists have attacked the subject since. M. Dufour, by taking the most delicate method and observing the greatest care to avoid contact of rough particles and metallic surfaces with the water, succeeded in raising the temperature of very minute globules to 175° C. (347° Fah.), which is that due to steam under a pressure of 115 pounds to the square inch. It is found necessary, however, in such experiments, to operate with very clean water in very small quantities, and to be exceedingly careful to avoid the slightest motion of the liquid, and also to keep it from contact with metallic surfaces or mineral substances.

M. Donny's experiments were made with glass vessels, but M. Dufour was compelled to suspend his drops of water in a mixture of oil of cloves and linseed oil, to secure the success of his experiment. Such conditions evidently never occur where water is vaporized in steam boilers, and we may probably feel confident that such superheating is not likely to produce steam boiler explosions. The mass of water in the steam boiler is too large, and is invariably in contact with a metallic surface. It is probably always in motion to at least a slight extent, as the irregular distribution of heat in all ordinary boilers must produce generally some slight circulation at all times, and finally it rarely happens that feed water is absolutely free from impurities (Journal Franklin Institute; third series, Vol. XCIII., page 98). While, therefore, we cannot say positively that explosions have never occurred from this cause, we are fully justified, probably, in supposing it to be the fact.

THE PRESIDENT'S MESSAGE AND THE VIENNA EXPOSITION.

"To further aid American exhibitors at the Vienna Exposition, I would recommend in addition to an appropriation of money, that the Secretary of the Navy be authorized to fit up two naval vessels to transport between our Atlantic cities and Trieste, or the most convenient port to Vienna, and back, their articles for exhibition."

The above from the recent message of President Grant, though constituting the sole reference to the Vienna show, is sufficient to prove that our excellent chief magistrate, desirous, as he doubtless is, to promote the industrial interests of the country, has not fully appreciated the gross amount of the expenditure which he thus recommends to Congress. Assuming that the appropriation referred to will reach the figures demanded by the United States Commissioner, namely five hundred thousand dollars, let us add to this sum the expenses of two men-of-war to Trieste and back, covering say a period of seventy days for the voyage, and not including the time of fitting out and the period intervening between their return to the United States and the date of their going out of commission. It may, we think, be safely assumed that as but two vessels are specified they will be of the largest size, or "first rates," and also, as they are not to be used as regular cruisers, and consequently will not carry their full complement of guns, that their crew will be reduced, say from 700 to 400 men each, including clerks, petty officers and men. The number of officers, line and staff, will also be lessened in proportion. Calculating the pay of all for seventy days, adding thereto the cost of one ration per man, and the expense of coal under the assumption that the vessels will be under sail alone for at least half the above period, at the smallest estimate we make the expenses amount to \$100,000 for both vessels. In addition to this \$30,000 is a small allowance for the balance of time the ships are in active service and contingencies in the shape of detention by bad weather, prolongation of stay abroad and other necessary expenses. So that the total bill which the country is asked to pay for the privilege of being represented in Vienna by a few manufacturers and inventors and a large number of office-holders is \$630,000. Now let us sum up the amount of floor space allotted to the United States in this show: 13,000 square feet in the machinery annex; one transverse gallery 500 by 49 feet, or 24,500 square feet, and a portion of the central pavilion, at the most say 5,000 square feet; total 42,000 square feet, or, to make matters clearer, the entire space would barely equal that of a hall 207 feet square. Consequently the country is taxed at the rate of \$14 per square foot for every inch of floor, including passage ways, waste space, etc. It appears to us that this will be more than all the machinery, etc., that can be placed thereon, will be intrinsically worth.

We should like to understand from our Congressmen elected under pledges of voting in favor of retrenchment and of the reduction of the already heavy burden of taxation, whether they propose to support this unwarrantable extravagance? Does the President in view of the above facts consider that \$630,000 would be profitably expended? Referring to the taxes, he says, "It is very doubtful, however, whether any further reduction of so vexatious a burden upon any people will be practicable for the present." Can he, in face of this, urge an appropriation of which the greater portion, as we have shown, is to be devoted to the support of a pack of useless officials, and the total amount of which will inevitably be increased to a round million as soon as the people begin to discover that they can obtain so grand an advertisement free of expense? Can the United States afford to appropriate twenty-one times as much money as Great Britain for this purpose? A sum sufficient to begin the reorganization of our dilapidated navy, instead of allowing that branch of the public service to remain a disgrace to the country; and now still further weakening its pitiful force of 45 effective vessels by withdrawing two for transport duty.

We protest against any such waste of the public funds. The treasury is anything but replete, and every bureau of the

government is now waiting for its yearly appropriation. If we have any surplus let it be devoted to the re-establishment of our commerce. If the country once more recovers its carrying trade and owns a mercantile navy commensurate with its rank as a first class power among nations, our industries will be a thousand times more benefited than by any number of such shows as this Vienna Exposition.

CONCENTRATED SOLAR RAYS.

A paper detailing some experiments upon solar rays which it was claimed resulted in the discovery of some hitherto unknown, and most remarkable properties of the solar emanations, was published on page 309 of the current volume of the SCIENTIFIC AMERICAN, and attracted some attention. [On Certain Undescribed Properties of the Concentrated Solar Rays, by George Robinson, M. D.]

A reader has been endeavoring to repeat the experiments described but was unable to obtain the results described in the paper, and experiments made, at our request, with the great 15½ inch lens of the Stevens Institute of Technology also gave only negative results. We hope that our contributor will be prepared to repeat his experiments in presence of the faculty.

If the writer of the paper is correct, he has made one of the most wonderful discoveries. He should not lose the opportunity to make himself a name as a discoverer of equal rank with the greatest among those of either ancient or modern times.

A BADLY CONSTRUCTED BOILER.

"An engineer," writing from Philadelphia, encloses a sketch of a "sectional steam boiler" having V shaped water tubes, and states that it was tested with 105 pounds water pressure by the city inspectors, and that, four weeks later, on Thanksgiving Day, the engine driver, while cleaning flues, found several tubes burnt out and fallen to pieces, the fragments lying on the bottom of the flue, together with quantities of sediment, which, by stopping the circulation of water, had caused the mischief.

The usual pressure of steam is sixty pounds.

Our correspondent, who neglects to give us his name, asks our opinion of the boiler inspection department of Philadelphia.

We reply that what we have known of that department has led us to believe it to be unusually well conducted, and we must add that an anonymous writer is not usually considered to be entitled to notice. He is very liable to be suspected of unpraiseworthy motives.

Our deduction from the facts presented is that such boilers as that described are unfit for use where the water contains sediment or holds soluble salts, as the tubes are evidently not readily cleaned, and the deposit cannot always be blown out. In this case the tubes must soon have blown out, but the great advantage of the sectional form of boiler would then have been probably exhibited, as the explosion would have been unlikely to do any serious harm.

The boiler should be changed for one that can be cleared of sediment and incrustation readily, the fireman should be instructed to free the tubes of scale and deposit frequently, and the city inspectors should be informed of the circumstance, as it may be quite a novel incident. We believe the form of boiler referred to is quite lately introduced.

Let our correspondent send his name at another time, and if he does not desire to have it published, a request to that effect will always be complied with.

IF ANY ONE wishes specimens of the paper to examine before subscribing, tell him to write to the publishers and they will cheerfully mail them.

THE VIENNA EXPOSITION—PROFESSOR THURSTON EXPLAINS.

Professor R. H. Thurston, of the Stevens Institute of Technology, a frequent correspondent and valued contributor to our columns, has favored us with a letter, found on another page of this issue, in reference to our strictures upon the assertions contained in a certain circular, for which we have maintained the United States Commissioner to Vienna to be responsible. Our correspondent fails, we think, in his laudable endeavor to shoulder the blame. In a single sentence Professor Thurston first assumes the authorship, and declares Commissioner neither morally nor legally responsible for the the emanation, except as based upon information received from his office. Is not this rather inconsistent? Where should our correspondent obtain his authority or instructions save from the office of his principal?

The letter virtually says: "I am not responsible, and neither is the Commissioner, except for what he told me." Then General Van Buren in turn declares himself not accountable for the acts of his subordinates. Consequently we must infer that we have discovered an assertion which originated with nobody, for which no one is answerable, a sort of rhetorical "element," formed from no constituents and derived from a totally unknown source.

Our correspondent cites as an example for our emulation that the British Commissioners announce the space allotted to Great Britain as filled. Undoubtedly, and let us add by men who pay their own expenses, for \$30,000 is all that Parliament has appropriated. The example to be followed is not in the fact that England has crowded her limits with her products, but in that her inventors and manufacturers have aided themselves, and have not waited for the nursing of a crowd of officials or for their government to show them how to take care of their own interests. The assertion, that unless the United States act promptly, our space will be occupied by other nations, and our industries abroad greatly

injured, is the offspring of our correspondent's zeal in the cause that he advocates, as we think he will hardly maintain on calm reflection that any such results would happen, even were we entirely absent from the Vienna show.

With the residue of the letter we agree. If, as we have repeatedly urged, gentlemen, in various parts of the country, who are fitted for the work will voluntarily aid in collecting and forwarding American contributions, and if, influenced by purely patriotic motives, such persons will subscribe toward defraying the expenses of national representation in the Exposition, they will have no stronger supporters than ourselves. We believe in international exhibitions. We think the Vienna show a grand and invaluable benefit to all exhibiting nations, and we will willingly head a subscription list for funds, or render all other suitable aid in its behalf. What we desire and hope to see is a cessation of these efforts to bleed the government. The Commissioner complains of our opposition. If he will remit his roundabout manoeuvres to get at the public money, and seek funds directly from private parties, of whom he will find plenty sufficiently patriotic and interested to assist him, and if he will advocate the non-reliance of exhibitors on government, and urge them to independently meet their own expenses, he will not be wanting in every encouragement from the SCIENTIFIC AMERICAN.

IF ANY ONE WISHES AN ILLUMINATED CALENDAR for 1873, to hang in his office or shop, he can have it free on sending a request to this office.

TORPEDO WARFARE.

It need not be imagined, because the nations of the earth are happily at peace, that inventors are not as busy as ever in devising means for the destruction of their fellow men in time of war. New cannon, small arms, and army and navy equipage are constantly being invented, though perhaps no one subject is attracting a greater share of attention, nor indeed is of more importance in future maritime conflicts, than the submarine torpedo. As the iron protected ship has virtually driven the wooden vessel from the sea, so, it seems, is the torpedo boat as a means of harbor defense to supplant the floating fortress.

Although innumerable plans were proposed during the war for submarine crafts, few were put into actual use. Two or three, employed by the rebels, did their work, sinking the gunboat Housatonic and one of our small monitors, but in both cases the boats with their adventurous crews were lost, going down with the vessels they destroyed. Recently, a torpedo boat has been in process of construction at the Brooklyn navy yard, but it has fully demonstrated its utility by suddenly sinking at its moorings, thus adding additional evidence to the fact that no vessel of this kind is fit to trust a human life in, without the same is to be deliberately sacrificed. Many excellent forms of torpedo have been introduced, destined to be anchored in the channel and exploded at the proper time by electric wires leading from the shore; but the vessel of this description which can be manoeuvred by a crew and destroy even a single ship without finding its way to the bottom, remains yet to be invented.

A new apparatus, which seems to be the most formidable yet devised, has lately been tested before a board of army and navy officers at Newport, R. I. From the report of the performances we are led to believe that the inventor, Mr. John L. Lay, has accomplished an important step in advance in the science of submarine warfare. The hull of the craft is about thirty feet long and three inches wide, cigar shaped, and formed, water and air tight, of iron plates. It is divided into three compartments; one for motive power, another for machinery, and the third for electrical apparatus. The motive power consists in carbonic acid gas compressed in sufficient quantity to drive a pair of oscillating engines of eight horse power and thus operate the screw, for the period of half an hour, during which time the boat is designed to travel some six or eight miles. The machinery is controlled by wires leading to a battery on shore, the opening or closing of the circuit or wire governing the throttle, and the same on the second wire actuating the steering gear. The cable containing the wire is paid out as the boat moves, and of course no crew is required on board. The vessel is almost entirely submerged, and being painted green, is indistinguishable at short distances by the unaided eye.

In the magazine are placed 500 lbs. of powder or nitro-glycerin, and in the forward portion of the vessel explosive shells are also arranged, to be fired by an electric spark passing through a third wire in the cable. The explosion of the shells may be effected without injury to the boat, but that of the magazine necessarily causes her destruction. During the experiment at Newport, a torpedo charged with ten pounds of powder was put in position and then the boat was started from the shore of Goat Island. It darted off like a harpooned whale, and described a complete circuit of the harbor, going a distance of about two miles. The operator, who remained on shore, had perfect control of the craft, and with his electrical switches moved her to port or starboard and stopped her at will. Having demonstrated for a considerable time the facility with which she could be propelled and guided, her course was changed to the shore or the point from which she started. Then she was again sent out in the direction of a large rowboat, which had been anchored as an imaginary vessel of an enemy a short distance from the island. The bow of the boat, the point where the torpedo was placed, was directed against the rowboat, and instantaneously there followed the explosion of the projectile. The water was thrown about thirty-five feet or more into the air, and the timbers of the boat were sent flying in all directions. Quite a large number of prominent foreign officers witnessed

the tests, and pronounced favorable opinions at their close. We shall look with interest for further and more exhaustive trials, as the device, if thoroughly capable of fulfilling all the claims made for it by its inventor, must prove a highly important accession to our means of harbor defense.

ON THE RESISTANCE OF BUILDING STONES TO FIRE.

The recent extensive conflagration in Boston brings the subject of the behavior of building stones when exposed to fire again in the foreground, and it may therefore be well to publish a few remarks which may form a guide in selecting proper materials. It is only since the great fire in Chicago that the attention of the public, and more especially of builders, has been directed to this subject; and we possess, in an address delivered by Mr. Wight before the American Institute of Architects in the very same city whose fate we have now to deplore, an excellent summary of the various effects of heat on brick and stone. However, the account of Mr. Wight, notwithstanding the very valuable remarks it contains, leaves us in the dark with regard to many points. The facts alone are not always satisfactory; we wish to know the causes of such facts. Hence it can only be of local importance to be informed that the Athens stone was the worst to stand the test of heat, or that the Cleveland stone had not been injured at all. Mineralogy and chemistry can in very many instances serve the architect as a guide in the selection of his building materials: mineralogy because it makes us acquainted with the component parts, and chemistry because it teaches us at what degree of heat these elements will yield. Let us, therefore, review the facts brought before us in the light of science.

It is stated that none of the limestones stood the test of heat; but some were worse than others. The Illinois limestone, generally called Athens stone, "was, in very many instances, entirely calcined, so that there was scarcely anything remaining of some buildings which were built of brick with stone fronts." "With regard to this stone," says Mr. Wight, "it was a common thing for it to explode when the heat came suddenly upon it and was very intense. It seemed to calcine with great rapidity, and I suppose the effect was very much like that seen in the manufacture of popcorn." At the moment we write this, we are yet unacquainted with any particulars regarding the effect of the late fire upon building stones, but expect soon to receive such information with regard to the various limestones employed in the ill-fated city. The limestones used for building consist essentially of carbonate of lime, or of carbonate of lime and magnesia. These stones, when exposed to a red heat, are decomposed, namely, the carbonic acid is driven off and the lime remains in a burnt state; hence they crumble, or are burnt off entirely, or are consumed. When heated in places easily accessible to currents of air, the gas is entirely carried off, otherwise a part of the carbonate remains but imperfectly decomposed. Limestones containing magnesia (or as they are termed, dolomitic limestones) are still less fit for building materials than ordinary limestones, because magnesia parts with its carbonic acid quite readily at a comparatively low temperature (at about 600° F.), while this same degree of heat leaves the carbonate of lime intact. The knowledge of this fact is all important to the manufacturer of cement, since, if burnt at a high temperature, the product (a mixture of caustic lime and magnesia) is rendered unfit for use.

Mr. Wight, in his report, speaks of the so-called "petroleum stone," which the newspapers reported to be entirely consumed, but which, in fact, stood the heat very well. There was one church in Chicago built of this stone, in which the amount of oil was so great that the heat of the sun would draw it out soon after the stone was set up in a wall, and it would run down in black streaks. "The effect of the heat on the inside of the walls threw out upon the exterior all the oil it contained, which formed a thick hard coating, about a quarter of an inch in thickness; and though the interior of the church was exposed to great heat, and every particle of wood in it was burned up so that there was not a scrap left in it, the interior sides of its walls were not greatly injured. In some places the stone had flaked off, and yet this stone stood the test better than any other natural stone used in the city."

In consideration of the fact that the stone was a limestone, it seems very singular that it should have been saved from entire destruction. Yet this is explained when it is known that oleiferous limestones are often largely impregnated with quartz and alumina, some containing from 20 to 30 per cent of these substances, which are distinguished by their infusibility. These materials evidently protected the carbonate of lime from disintegrating, while the oil in the interior was prevented from burning on account of its being inaccessible to air.

That the various sandstones used in Chicago have stood the heat best, and that such must have been the case in Boston, may be concluded *a priori* from their chemical composition. Sandstones are, in fact, exceedingly well fitted for fireproof structures. "The only building in the burned district, on the south side, which stood intact," says Mr. Wight, "was of Cleveland (sand) stone; and in that building there was not a flaw, nothing cracked or broken. In fact, it was not injured at all, except that the solder in the galvanized iron cornice was melted, while the lantern of a lamp-post on the sidewalk was entirely melted, so that pieces of the tin frame work hung down like ribbons." The predominant ingredient of sandstones is quartz, a substance particularly infusible. Its amount varies from 80 to 97 per cent, the other ingredient being mostly peroxide of iron, alumina, lime and magnesia. The brown sandstone of New York, for instance, consists of quartz cemented by oxide of iron

Granite, quartz, mica, slate and other rocks belonging to the primary formation are generally considered to be almost indestructible, yet it is known that they readily get cracked and explode, even when only exposed to the heat radiated from neighboring buildings. This is explained by the known fact that they all contain water. It is a fact well known among quarrymen that the surfaces of fracture in broken granite, syenite, etc., are often found to be more or less moist, and this moisture is found not only as an element in the exterior portions of rocks, but also even in the center of blocks a foot thick, and in masses separated by blasting.

Regarding the artificial (Portland) cement stone, now coming so largely into use, we possess in it a material in every respect suitable for building purposes. Being a compound of silicate of lime and alumina, with water chemically combined, not mechanically inclosed, it will, of course, stand heat almost, if not quite, as well as any sandstone. In respect to the buildings in Chicago erected of artificial stone, we learn from Mr. Wight that they were scarcely injured at all. Others say that they stood the test of the great fire better than any other building material in that city. Every stone left standing in the walls, our informant states, was found to be in a perfect condition, and builders have been drawing the blocks away to be used in the erection of other structures. In justice to the inventor, it should be stated that this was the Frear stone now so largely used all over the West.

With regard to bricks, we know that they do not readily give way under fire. Some say that, as they have been burned, they must be of the best material imaginable. Yet these people forget that bricks are very absorbent and retentive of moisture. True, their moisture may readily escape, but then the bricks are left porous; and if over heated and vitrified, as it is often the case, they lose their strength and give way. We know that almost the whole city of Chicago was leveled to the ground, but this is principally due to the fact that the walls of the buildings were uncommonly thin in proportion to their height, and because they were generally built with a very inferior kind of material.

GERMANY IN THE VIENNA EXPOSITION.

The Berlin correspondent of the *Chronique de l'Industrie* says that Germany will have 7,861 exhibitors in the Vienna show. In Group 13, machinery, 763 well known firms are entered. There are 58 exhibitors of motors, generators, steam engines, turbines, etc.; 68 of machines for metallurgical purposes, forges, etc.; 78 of weaving and embroidering machines; 60 of paper-making machinery and printing presses; 55 of sewing machines; 125 of agricultural implements; 26 of sugar-making apparatus; 60 of distillers' machines; and 45 of miscellaneous devices; 42 houses will exhibit fire engines, and 42 locomotives and railroad fittings.

A very large proportion of the above are of American invention and largely manufactured and used in Europe. Why then should half a million dollars be paid by the country to rich manufacturers to advertise goods already thoroughly appreciated? Fifty-five exhibitors of sewing machines, from Germany alone, cover very nearly all the patterns in existence. Those made by such prominent houses as Wheeler and Wilson and Singer yield a yearly profit of millions. Is there any necessity for the country, already burdened with a too large national debt, to waste funds which ought to be applied in reducing the yearly interest on the same, on such immensely wealthy corporations as the above, or to pay a Commissioner and a host of assistants to collect articles already entered for exhibition?

HORACE GREELEY.

To those whose daily avocation called them to localities in which the well known face of Horace Greeley was as familiar as a household word, no counterfeit presentment will be needed to recall his features to the mind; to others, the engraving to which we devote our initial page will be doubly acceptable as a portrait and memento of the great and good man who so lately has passed from among us. Than Mr. Greeley, no one has contributed more, both by word and pen, to the rapid advancement in industrial interests of the United States. Eminently broad, liberal and charitable in his views, no scheme, having for its end the benefit of mankind, failed in obtaining from him at least a patient hearing and investigation, and often a strenuous advocacy in the columns of the journal which he so ably edited. His philanthropy sometimes outbalanced his better judgment, leading him to support projects and ideas which in the end proved chimerical.

Of the rights of labor Mr. Greeley was always the staunchest of champions; to the inventor, a firm and unwavering friend. An implicit believer in the future industrial supremacy of the country, his genius was earnestly devoted to the support of the producing classes. Himself a self made man, he spared no efforts in assisting others to help themselves; and with that benevolence which to him was an inspiration, even sacrificed his own interests and boldly faced public animadversion in behalf of those who, struggling against adversity, applied to him for counsel and assistance.

The life so nobly spent in battling for the cause of right and justice has indeed sadly closed. With ambition crushed and the frail foundation on which he built his hopes thrown to the ground, with the dark shadow of death invading his household circle, the grand intellect which for so many years had commanded the admiration of the world succumbed, and sinking under the full measure of affliction the great journalist calmly passed away, leaving to posterity in his name an undying monument and a shining example of genius and ability, patriotism and honor.

NEW BURLINGTON HOUSE, PICCADILLY, LONDON.

This splendid building has recently been erected for the accommodation of six learned societies, the importance of which to the public interests justifies the British Government in providing them with a home. They are: The Royal Society, the Royal Astronomical Society, the Society of Antiquaries, the Linnean Society, the Chemical Society, and the Geological Society. A list of the members of these bodies from their respective beginnings would indicate all the great scientists of the world. The Royal Society, the oldest scientific institution in the world, was founded by royal charter in 1662; and in the list of its presidents and secretaries we find the names of Christopher Wren, Samuel Pepys, Isaac Newton, Wollaston, Humphrey Davy, Halley, John Herschel, and many others almost as renowned. The Society of Antiquaries was founded in 1572, but was for many years lost sight of. In 1751, it was incorporated by royal charter. The Linnean Society was founded in 1788, and the three others are all dated since the commencement of this century.

In the New Burlington House, fitted interiorly in a manner worthy of the handsome façade of the building, these six learned bodies are now located. The Royal Society has the largest share of the space, and handsome rooms are provided for the meetings of its 600 Fellows, and for its scientific library, which is simply invaluable.

The building stands on the north side of Piccadilly, in front of the original Burlington House, which is now occupied by the Royal Academy of Arts. The entrances to the rooms of the six societies are on the interior quadrangle, to which the large gateway, shown in the center of our illustration, leads.

It will be seen that the architects, Messrs. Banks & Barry, have adopted a design of pure Italian architecture, of which there have been but few examples lately in London; and, taking as their key note the general features and proportions of the façade of Old Burlington House, which was to form one side of the quadrangle, the architects have endeavored to blend it with their new composition, with sufficient similarity of design to effect this, but with more finished details.

Great convenience is anticipated to scientific men from so many of the learned and scientific societies being placed in close proximity, as it naturally is the case that many individuals are members of several societies, and the meetings of several being held on the same days, members can readily pass from one to another. It was indeed suggested, at one time, that one or two large meeting rooms only should be provided to be used by arrangement in common by all societies, and that thus other scientific associations might also be accommodated in the building. It was, however, finally considered by the societies themselves, that from the differing organization of each, and the differences of the means at disposal of each, such a scheme would be attended with much difficulty, and each body, therefore, will now be self-contained in a division of the building specially appropriated to it alone.

Chinese Mechanics.

There are no better carpenters, masons, or other handicraft men, more expert, or faithful to their employers, than heathen Chinese. When a contractor engages to build a house, for example, he incloses the premises and sets up cooking apparatus to supply his hired workmen with regular meals at the most economical rate. Having taken breakfast they work till noon, rest one hour, resume work, and leave off at five P. M. and return to their homes. On leaving, each takes a ticket, which admits him next morning. These tickets are daily vouchers of the artisan's presence. Counted up at any time a true account is rendered.

ments far outgeneral very learned gentlemen of world-wide celebrity. In short, mortifying as it is to make the confession, our wisest men of modern science don't know everything.

A Scientific Carpenter.

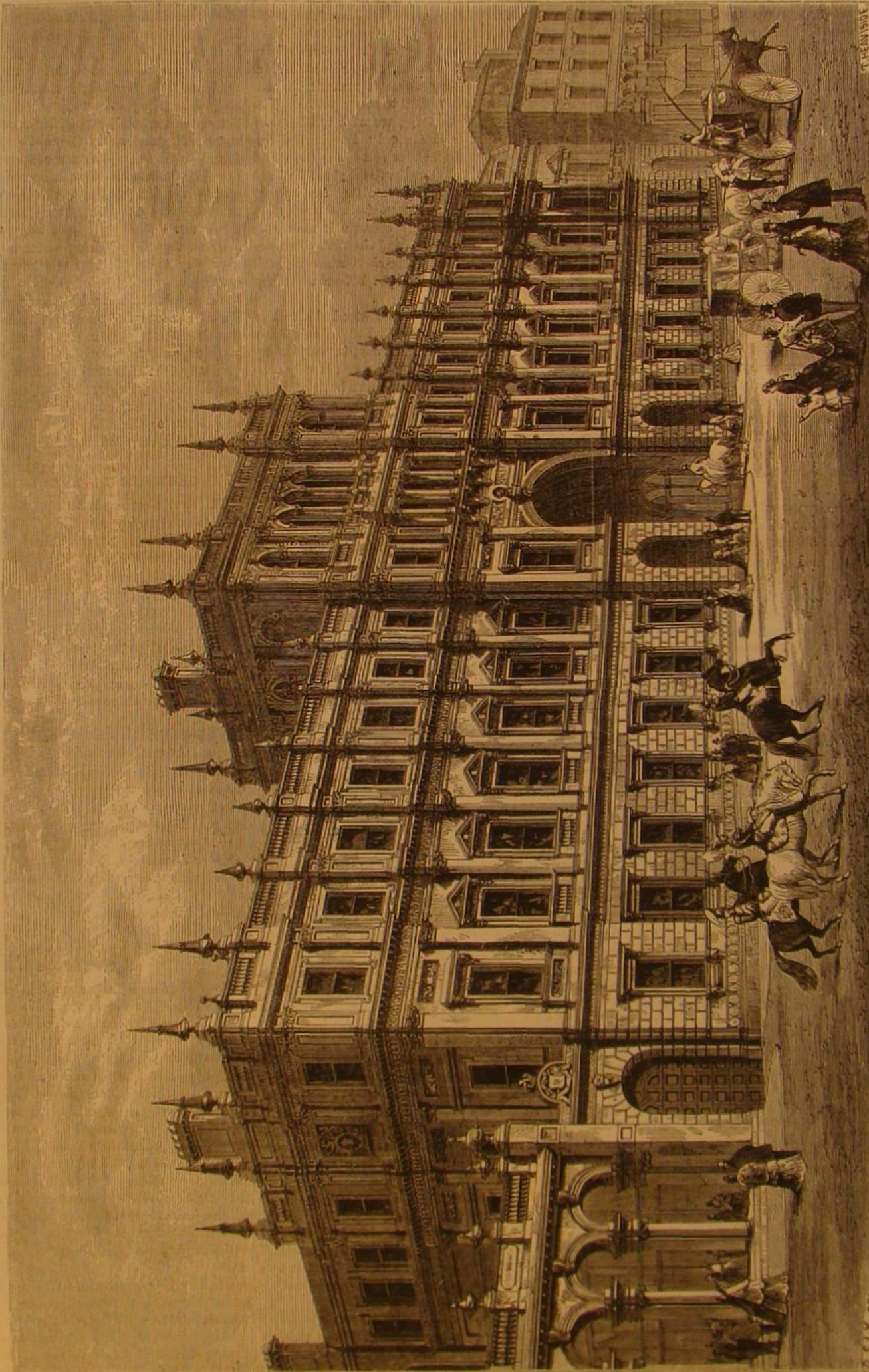
When the steamship Idaho arrived at San Francisco, from the Sandwich Islands, not long ago, she had on board the novelty of a wooden cylinder head. It appears that when several days out from Honolulu, her cylinder head was broken into fragments, and the engine could not be used. She had just reached a point where the trade winds failed her; her sails were scarcely large enough to steady her in rough weather, and retarded as she was by her propeller, the chances for getting to San Francisco, or even back to Honolulu, were rather blue. In an ordinary breeze her sails just gave her headway enough to be steered, and as few vessels cross or follow the Sandwich Island steamship route, the passengers resigned themselves to fate, and made up their minds to endure a long and uncertain float. The captain was about to be petitioned to put passengers and crew on short allowance, when a carpenter, who was a passenger on board, came to the rescue.

On examining the injured cylinder, the idea entered his mind that a stout cylinder head, of tough hard wood, might stand a sufficient pressure of steam to run the engine at moderate speed. He stated this to the captain, who, after some hesitation, and as a last resort, reluctantly gave him permission to try the experiment. The carpenter procured his tool chest from the hold, and after twenty-five hours hard work, finished and inserted the wooden cylinder head. It was made of three thicknesses of hard teak board, rendered steam-proof by being covered with paint and canvas, and was calked tight, and held in its place by bolts, as in other cylinder heads, and by a piece of timber braced against its ends. When the carpenter announced that the engine was ready for use, and desired the engineer to turn on steam, there was a general scamper from the cylinder, where numbers of the passengers, sleepers and feverish, had anxiously watched the finishing of the work. Slowly the steam was turned on, the piston rod rose and fell, the propeller churned the water quickly, the Idaho moved on at her accustomed speed, and

the wooden head was a success. The cylinder head, after being used for a time, swelled and collapsed like the lungs in respiration, but the invention stood the test to the end, and earned for the carpenter quite a reputation. He has become a very hero among sea-going men at San Francisco.

WHAT MORE VALUABLE PRESENT can be made to young mechanics than a year's subscription to the SCIENTIFIC AMERICAN? Employers will be doing their employees a great service by acting on this hint, and we feel sure that at the end of the year they will consider the investment a good one.

NOW IS THE TIME for forming clubs for the new year



NEW BURLINGTON HOUSE, PICCADILLY, LONDON.

A man on the ground throws several bricks to another ten feet above, and he to another still higher. Thus the masons are supplied as they ascend with the wall. Instead of carrying mortar in a hod, it is thrown by a shovel full from one story to another, to any required elevation, without spilling particle, so expert are they by continual practice.

With a small brass wire, made tense in a bow, notched on the lower side, they saw out artistically complicated puzzles that are surprising specimens of art. Thus they excel in many ways our most skilled artists, almost without tools. In departments of science, in which we suppose ourselves in advance of Orientals, they accomplish results quite beyond our comprehension. Some of their chemical accomplish-

NEW METHOD OF BREWING.

M. Pasteur, an eminent and well known French chemist, has for many months been engaged upon the development of a new system of brewing on what he conceives to be a more scientific principle than any yet adopted. The principle upon which he proceeds is that, by the exposure of the wort during the process of fermentation to the action of the atmosphere, the resulting product is materially deteriorated, owing to the absorption of oxygen. But the difficulty of inducing fermentation, under circumstances in which the atmosphere is expelled, or nearly so, from the square or other fermenting vessel, has been considered practically insurmountable, until M. Pasteur hit upon the method, the description and illustration of which we extract from the *English Brewer's Guardian*, and now lay before our readers.

"I desire," says M. Pasteur, in a patent applied for in 1871, during the stormiest days of France's misfortune, "to take out a patent for a new method of brewing, which consists essentially in a system of fermentation apart from all contact with the atmosphere. The wort, after being boiled, is turned into vessels of wood or metal, cooled in a current of carbonic acid gas, and then set to ferment."

Such is the principle, and our illustration represents the construction of the apparatus devised to carry it into practice. EEE' are pipes for the conveyance of cool water, which is distributed by

the rose nozzles, P, over the fermenting apparatus, F F F'. At M M is shown the carbonic acid apparatus, and at C C C, the discharge pipes for the water from the troughs, g g g', where it is collected very hot at the outset. F' is a different arrangement of the fermenting apparatus, in which a movable cover closes the cylinder by means of a water-tight casing, the bottom of which enters the outside trough g' g'. G is an ordinary gasometer, with entry and exit pipes. t t t are thermometers, which indicate the pitching, etc. The capacity of the apparatus can vary from 22 gallons to 220,000 gallons.

The carbonic acid gas produced during fermentation, after having traversed a washing bottle where it is freed from any froth it might contain, is delivered into a zinc or tinned iron reservoir placed a little below the fermenting apparatus. At the lower part of this reservoir are arranged a number of sockets and taps. When it is desired to cool the wort in the presence of carbonic acid, as it is useless to mix up this gas with the liquid, it is sufficient to put one of the taps of the reservoir in communication with one of the tubes of the apparatus F F F'. With a rapid cooling, carbonic acid may be dispensed with, and ordinary air may be allowed to enter in proportion as the bulk of the wort diminishes while cooling. The germs of disease in the wort are killed in the boiling, and those which the volume of free air just mentioned may carry will not have time to develop in the wort, if the cooling process has been prompt.

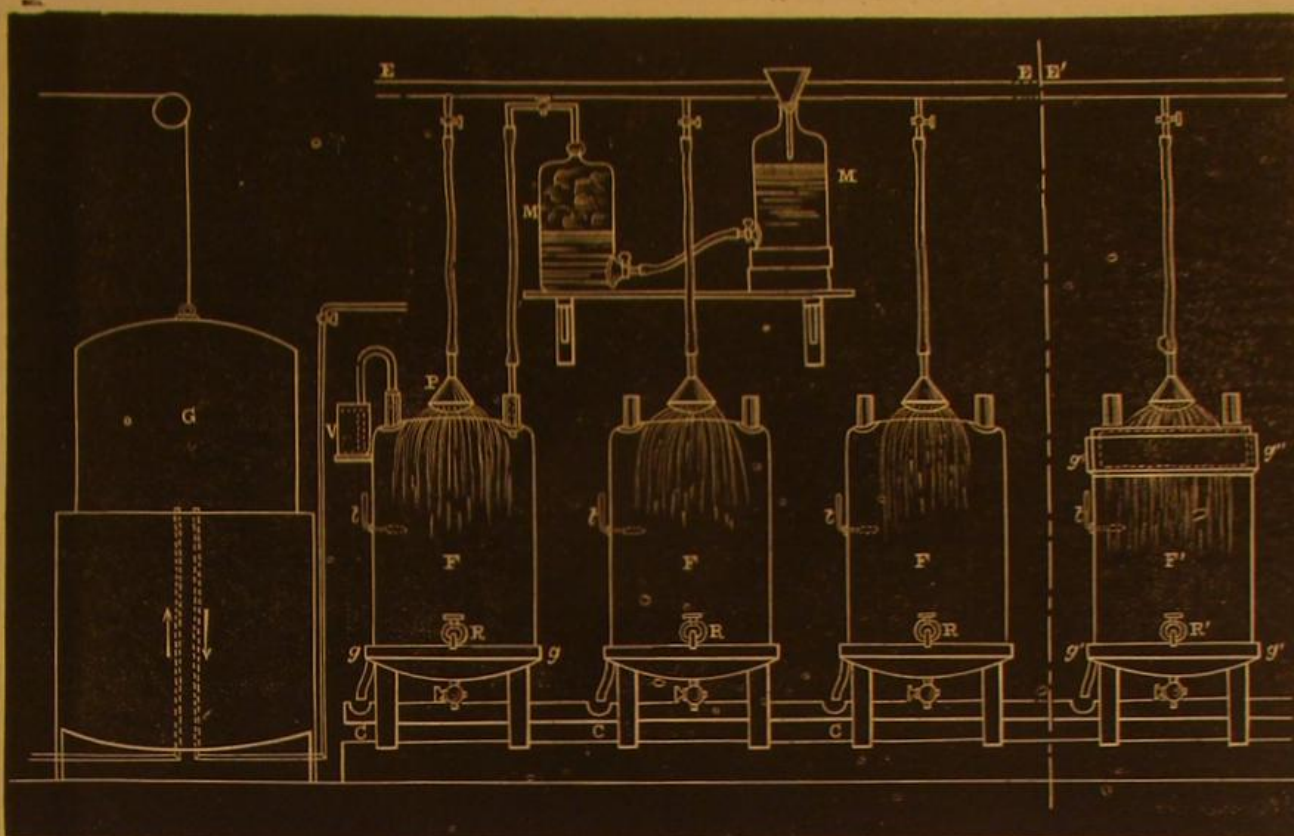
M. Pasteur states that cooling of the wort may be effected either by special tubes placed in the vessels, F F', where cold water circulates, or common refrigerators may be made to serve by inclosing them in a vessel full of carbonic acid gas or of air deprived of germs, and even ordinary air, if the vessel is of small capacity, or, in the manner shown in our engraving by a stream of water on the outside of the vessels.

The inventor has also devised a method of obtaining the ferment deposited in the vessel, F, in the shape of a cake, and has discovered that the *mycoderma vini* can be made the nucleus of a mild yeast. It can be made to develop itself in the wort of beer sheltered from the air. The advantages claimed are the disuse of cooling backs, the avoidance of loss by evaporation, filling up, etc., the abolition of store cellars, if needed, a great increase in the quantity produced, notwithstanding an augmentation of the strength of the beer, the development of a very agreeable bouquet, and the non-requirement of ice houses for fermentation at a low temperature.

The *Moniteur Scientifique*, in speaking of the invention, says: "Tributaries of a nation whom we will never pardon for our undeserved disasters, it is our duty, henceforth, to resort to French sources alone for the supplies of that creamy drink to which Munich is so greatly indebted for her renown." It adds, that M. Pasteur, "preparing on his part the sublime revenge of genius," has required that all beers brewed under his method, be called abroad *Bières Françaises* (French beers), and known in France as *Bières de la Revanche Nationale* (Beers of the National Revenge).

Fireproof Paint for Wood.

Dr. Wiederhold says that two substances have been recommended for this purpose: chloride of zinc and silicate of soda (soluble glass) both being generally well adapted to protect wood against combustion. As regards the chloride of zinc, the author states that, in case wood impregnated with it be exposed to fire, a most offensive vapor would be disengaged, which would make the surrounding atmosphere entirely insupportable by man. The soluble glass, on the other hand, is readily washed off in places not protected from rain and snow, and may therefore be of no value in cases of emergency. There are two older recipes, which have always

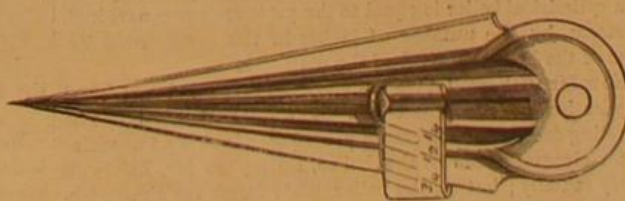


PASTEUR'S NEW METHOD OF BREWING.

been used with success. The one calls for the brushing over, twice repeated, of the wood work with a hot solution of three parts of alum and one part green copperas. When dry, it is to be coated again with a diluted solution of copperas, into which white pipe clay has been stirred until the mixture acquired the consistency of a water color. This latter coat may be repeated once or twice. Alum and copperas penetrate deeply into the timber, and combine partly with the fiber, forming insoluble compounds which are not readily lixiviated. The coating of clay affords protection against excessive absorption of moisture, whereby freezing and washing out are prevented. It is evident that it will be advantageous to repeat the coat of clay from time to time. By the other method the wood is repeatedly brushed over with hot glue water, until it ceases to absorb it, which will be indicated by a coat of glue remaining on the surface. Now it is painted with a thicker solution of glue, into which, while yet semi-liquid, a powder consisting of one part sulphur, one part of ochre or clay, and six parts of sulphate of iron is sprinkled. These ingredients are, of course, to be well pulverized and mixed with each other. The author, a recommends these recipes from his own experience.

BUTTON HOLE CUTTER.

This instrument, suggested by H. Walker, of London, is made of thin sheet steel, with one sharp cutting edge, the other portions being corrugated to give the requisite stiffness.



The sliding gage being placed at a suitable distance from the point, it is held by the finger and the thumb; all that is then necessary is to place the point where the hole is to commence and to thrust straight downward, when it cuts a hole of the width required, and will cut any number of holes precisely alike. The one side has a cutting edge, and, the back being rounded, it cuts only in one direction.

THE FACT of the *SCIENTIFIC AMERICAN* having been published by the present proprietors every week for twenty-seven years, should be a sufficient guarantee to new subscribers that they will get the paper regularly and all the numbers they pay for.

SPECTRUM OF THE AURORA.—Vogel has determined that the spectrum of the aurora may with great probability be regarded as a modification of the air spectrum, the variability of the spectra of gases under different circumstances of temperature and pressure being well established.

NOW IS THE TIME for old subscribers, whose subscriptions expire with the year, to renew.

NOW IS THE TIME for new subscribers to send \$3 and commence with the new year.

A British Scientific Expedition.

The *Challenger* an eighteen gun screw corvette, of 2,306 tons, is now lying at Sheerness, preparing for a lengthy voyage, which it is confidently believed will confer very great benefits upon science. She is commanded by Captain Nares, with Commander Maclear, of the *Eclipse* expedition, as second. The vessel is being fitted out by the Admiralty for the purpose of sounding, dredging, and investigating the "science" of the deep sea, the Government having acted in a very liberal manner in providing all the funds and necessities required. The scientific staff consists of Professor Wyville Thomson, as director; Dr. Von Willmoes Saum, Mr. H. Moseley, and Mr. J. Murray, as naturalists; Mr. Buchanan as chemist; with sundry other competent assistants in the different branches of science. The *Challenger* will be well supplied with boats of different kinds, including a steam pinnace, and will carry an ample assortment of the various appliances used in dredging, and an almost inexhaustible stock of spirits and bottles for the preservation of "objects." Under the experienced supervision of Professor Wyville Thomson everything that can possibly aid in exploring the different seas through which the vessel will pass, will form part of her cargo; and

a small aquarium will be constructed for the purpose of studying interesting animals in the life. The route of the *Challenger* is not yet settled, but she will leave England in the beginning of December, and the first haul will be made in "the Bay." From Gibraltar she will probably visit Madeira, sailing thence for the West Indies, and after touching at sundry places on the Brazilian coast, cross to the Cape of Good Hope. The Islands in the Southern Ocean will then be examined, with a run to the ice, and after exploring the Australian seas and Oceania, the expedition will proceed to Japan, Kamschatka, passing through Behring's Straits to the Northern Ice, and back to Vancouver's Island and the western coast of the Americas, round the Horn and home. The voyage will occupy probably four years, and the expedition cannot fail to be of lasting benefit to science, if not directly to the nation at large.

Lowering Ship's Boats.

A correspondent, J. A. A., of Ill., comments on our article of November 16, entitled "Life Saving Inventions Needed," and calls public attention to an automatic life boat, tested by the board of supervising inspectors at Washington, D. C., in July, 1871. Means were taken to capsize the boat repeatedly, the persons in her hanging to her thwarts; and when bottom up, being allowed to take her own course, she righted herself in an instant, and emptied out all the water she had shipped in 30 seconds. She was 16 feet long, and would bale herself with five persons in her, and would carry 25 persons. When loaded, the inventor states she is harder to capsize than any other boat. The correspondent regrets the cost of this boat, which is about one third more than that of the boats with which the ill fated *Missouri* was supplied, and somewhat satirically suggests that owners of sea-going vessels may find this an insuperable objection. The inventor of this boat is a poor man, and is unable to push his invention, or to sell the boats for less than cost price to bring them into public notice. J. A. A. also reports the invention of a self-clearing boat launching apparatus by an inventor at Metropolis, Ill.

NOTE this fact that, for \$3, a copy of the *SCIENTIFIC AMERICAN* is mailed every week for one year to any address in the United States.

Pattern Letters.

It will be seen, from an advertisement in another column, that Mr. S. E. Adamson, formerly of Philadelphia, has opened an establishment in this city for the supply of pattern letters. He is a practical die sinker and a skilled workman, having few equals. The specimens of letters he has shown us are very fine, having almost the accuracy and sharpness of printing types. His letters, we think, will be found to be superior to any thing of the kind now before the public.

REMEMBER that one year's numbers of the *SCIENTIFIC AMERICAN*, costing only \$3, contain more than an equivalent of 4,000 ordinary pages of book matter.

Curiosities of Natural History.

When I am reading, and a fly settles on my hand, I don't kill it; I watch it, with a glass perhaps, and see it clean its wings and its head, and make friends with it till I feel I can speak to that fly; and so it is with everything living. If we will humble ourselves and condescend to look at the apparently lowest creatures, we shall find instruction in the meanest of them. But all animals cannot live unmolested. The balance of Nature must be preserved, and everything has its enemy and its prey. The lion and tiger—*carnivora*—kill the herbivorous deer and cattle. The insects fall a prey to the birds and fishes; the fishes again to the birds, and in our attempts to preserve certain highly prized animals, and destroy 'vermin,' we must not forget this law." Mr. Buckland reminded his audience how rabbits and rats were increasing, and the ratcatcher had to be paid to destroy them because all their natural enemies, the weasels, stoats, owls, and hawks, were being exterminated. When he was in Staffordshire last week, a nobleman asked him if he could recommend any remedy for a terrible plague that had attacked his noble pine trees, the topmost shoots of which all died and withered away. "Encourage woodpeckers," said Mr. Buckland. "Why," said his lordship, "I have given directions for them to be destroyed." "And serve you jolly well right," interrupted Mr. Buckland, "that you are troubled about your pines."

Turning to the larger animals, the lecturer instanced the elephant, the largest of existing animals, so docile that it can be managed by a boy, but endowed with such strength that nothing can withstand its anger. Its tusks, he explained, are given as its chief means of offense, and also as a means of boring holes into morasses, in which collects the water that is sucked up by the trunk. The enormous power of an elephant, he exemplified by producing an iron plate, which had been bored through and through by the tusks of a young elephant, who did not appreciate the kindness shown to him in the devotion to his own use of a fine new elephant house. An elephant can protect himself against his natural enemies, but he can't invent, as man can, the means of exterminating such strange enemies as attacked an elephant in the Bristol Zoological Gardens. A poor animal confined there became so ill and so tender in its feet that it could not stand, and nobody could discover the cause of its lameness till Mr. Bartlett, of the Regent's Park Gardens, was sent for. He immediately, with his usual readiness, pronounced the disease to be—rats. These rodents, finding the poor elephant's feet good practice for their teeth, had operated upon his soft pads. Mr. Bartlett ordered a new house to be built, and now the elephant is "as jolly an elephant as any in the United Kingdom." These animals are led by the ear, and man has found out that his own tusks can be turned into trumpets, with which the natives imitate the sound produced by the elephant itself through its trunk, and so entice them till they can secure them. Two of these elephant tusk trumpets were produced by Mr. Buckland, who "played a tune" upon them, at the same time expressing a hope that none of the elephants in the neighboring Zoological Gardens would hear the call, and come rushing into the room.

Another large animal is the hippopotamus. Two of these animals have been born lately at the "Zoo," and Mr. Buckland excited the interest of his hearers by announcing that another was shortly expected, every preparation for the "little darling," though it is as big as a calf, having been made under the management of Mr. Bartlett, to whom Mr. Buckland appealed as the wet nurse, "to know if it had arrived yet."

Adverting to fish, Mr. Buckland exhibited many very interesting specimens of stuffed and dried fish and plaster casts, some of them beautifully painted by Mr. H. L. Rolfe. He showed the jaws of a large shark, the formidable quadruple array of teeth in each of which excited no little dread of meeting a living specimen of such a monster. Mr. Buckland easily passed the opened jaws over his head, and they nearly encircled his shoulders; so that, as he remarked, Mr. Shark would not have made much of a mouthful of him. The specimens of the teeth of shell-crushing fish, such as the gilt-head bream, were shown, and the lecturer asked if any one present believed that such beautiful mechanism, so well adapted to the habits of the several fish, was the result of anything but a well ordered and regulated system by an Almighty hand. From fishes' teeth, he came to the other armament of fishes, the saw and sword of the fish named after those appendages, and the electric apparatus of the torpedo and electric rays and eels. An instance was given of the power of the sword fish in the case of the ship *Dreadnought*, whose bottom was pierced, and the cargo of rice spoiled, on a voyage from Colombo to London. The vessel was saved, and became the subject of a long law suit, in which Mr. Buckland gave evidence to show that the injury was most probably caused by the sword of a sword fish. A copper plate was produced showing the hole made—about half an inch in diameter. The jury could not come to any definite conclusion, and gave a verdict that the injury was done by a "cause other than water." This Mr. Buckland considers equivalent to saying that a boy, who gets a black eye, receives the injury from "a cause other than air."

Of the depredations caused by the saw fish, an example was given in the injury done to the Indian telegraph cable, which one day ceased working when messages on which, perhaps thousands of pounds, depended were waiting for transmission. The "fault" was discovered by the electricians, but to Mr. Buckland was left the honor of discovering the cause. Examining the cable, he found that it was pierced from one side only, some sharp substance having penetrated through

wire, gutta percha, and all the outside covering to the "core." Had a fish bitten it, he argued, there would be a double mark, one on each side, so it couldn't have been a fish. At last he thought of the saw fish, which gets its living by "routing" about among the sand with its long, spike-covered snout, and found that a specimen he produced exactly corresponded with the remnants of a spike found in the piece of cable.

Mr. Buckland next explained the electric apparatus of the torpedo and electric eel; a cast of a specimen of the latter fish from the Amazon was exhibited. Mr. Buckland stated that the gentleman who brought it to England kept it alive till within a few days of Liverpool, when, putting his hand into the water, he received a shock which "knocked him flat on his back." He recovered, but the fish didn't. Casts of a sting ray, caught at Ramsgate, and of an eagle ray, and a stuffed angler fish, were also exhibited. The latter is a somewhat spherical-shaped flat fish, with a large mouth, and two barbules immediately over the head. These barbules, called its fishing rods, it waves about in the water, attracting the attention of other fish while it lies otherwise motionless itself. When its prey are attracted in sufficient numbers, it rears its head and opens its huge mouth, and the "angler" puts them in his basket. "Who," says Mr. Buckland, "believes that a fish ever grew a fishing rod out of the top of his head by wishing for it, if he wished for it, thousands of years? I never developed anything on my head."

Speaking of popular fallacies and vulgar errors, Mr. Buckland asked his audience—which perhaps contained young men who one day would be among the rulers and chief men of our land—to see for themselves, to hear all they could, but not accept as gospel what they heard till they had proved it. He wished to encourage a habit of examination and inquiry among young and old. He gave some amusing instances of attempts that had been made to impose on himself. A "monster," said to have been shot in the woods of Japan, was brought to him, and a large sum asked for it. A hideous wretch it was when produced, but he soon discovered that it was made of gutta percha, and was ingeniously fitted with eyes, teeth, nails, etc., from various incongruous animals.

A workman, at Windsor Castle, came one-day to Mr. Buckland asking for a reward for a grand discovery he had made. Mr. Buckland wanted to see the curiosity first, and he won his way to the man's heart down his throat, by means of a glass of brandy; and was gravely told that the wonder consisted in the skeleton of King Charles I.'s parrot. Mr. Buckland was not long in seeing that it was the partial skeleton of a rabbit, perched on its hind legs.

The Chinese, too, try to deceive us barbarians with their pearls. The lecturer showed a large pearl shell, in which were seven or eight images of the god Buddha, coated with a secretion of mother of pearl. The Chinese say the oyster deposits this secretion itself, when Master John Chinaman inserts these images. Mr. Buckland was sceptical, but said nothing till he had proved that the secretion was as natural as the little images themselves. It was a solution of the real mother of pearl, artificially applied and painted over the images.

Then he showed up the delusion concerning the pilot fish, that little fellow crossed with blue stripes, that is said to pilot the shark to his prey—declaring that he is as much a pilot to the shark as the starling is to the sheep. Do we think the starling is in love with the sheep that it settles on its back? No; it is then busily ridding the sheep of its natural tormentors—its Norfolk Howards. Such an office does the so-called pilot fish fill in regard to the shark.

From fish proper the transition is easy to the water animals, such as the seal, the walrus, and narwhal. Some beautiful horns of the latter, eight feet long, were exhibited, and a magnificent stuffed head of a walrus, with its tusks, twenty-two inches long. The instruments employed in the capture of whales and eels were shown, and their use explained. The seal, Mr. Buckland regretted, was becoming more and more scarce, and he expressed his determination to "kick up a jolly good row" on the subject, and, if possible, get a close season established when it should be illegal to kill them. He handed round to the visitors a specimen of seal-skin in its three stages of preparation for use, part being in its natural state, part with the long hard hairs taken away, and the third portion cleaned and dyed. As a hint to the ladies present, he recommended them not to have their seal-skin cloaks made with the fur the wrong way; it was only a plan used by the furriers to make the cloaks wear out sooner. If they wanted seal-skin cloaks, let them wear them like seals—the right way up.

We have not referred to half the subjects Mr. Buckland touched upon; but we must conclude by repeating the advice he pressed upon his hearers, that they would back him up, and he would do all he could to concentrate in England everything that is good. He wants more support from the public, and he will guarantee that they shall soon have salmon, at, for instance, 6d. a pound. But that is only one point, though a grand object to attain. He declared that he was endeavoring to follow his father's footsteps, and hoped that all his hearers would do likewise; then they would discern that there is a reason for everything, order in everything—and a Supreme Being to be seen and honored in all the various branches of life; and Science, instead of trying to controvert or clash with religion, would be one of its chief supporters.

EVERY EMPLOYER should present his workmen and apprentices with a subscription to the *SCIENTIFIC AMERICAN* for the coming year.

PATENTS IN JAPAN.

Japan is very rapidly taking her place among the progressive nations. Steam power, telegraphs, railways and modern appliances are everywhere being introduced in that country and in May last the following patent law was created. Like the patent law of Mexico it is a little behind the age, as its privileges appear to be restricted to persons resident in Japan:

THE PATENT LAW OF JAPAN.

Henceforward exclusive permission to trade in newly invented articles of all kinds whatsoever will be granted to the inventors; in consequence whereof, should any person residing in any part of the country be desirous of obtaining such exclusive permission, the application shall for the present be made to the Home office in accordance with the regulations which follow.

Patents shall be granted for a term of years to all persons who increase the conveniences of life, who newly invent any chemical apparatus, machinery, utensils, or furniture, weapons, woven fabrics, etc., or who improve existing furniture or utensils. The term of years shall be fifteen years, ten years, or seven years, according to the value of the invention.

Any person desirous of obtaining a patent shall send in his application to the local authorities of the district in which he resides, accompanied by a description, drawings, etc., which shall be forwarded to the Home office, and the Home office shall issue the patent.

The objects of the invention or the improvement shall be carefully drawn in cross section and plan, and in the case of machinery the parts must be numbered or lettered in accordance with the description, so that everything may be clearly comprehensive at a single glance; and the seals of the inventor and of his surety must be attached to the drawings. Models may be furnished of articles of which drawings can not easily be made.

When the document containing the patent is issued by the Home office the local authorities shall deliver it after having obtained a receipt from the inventor and his surety.

A duty of five rits (\$5.30) shall be paid annually in advance during the period for which the patent is granted into the hands of the local authorities. The duty may be increased or diminished according to the nature of the invention. The amount shall be forwarded to the Home Department as soon as it is collected. No duty shall be paid until six months have elapsed from the granting of the patent, that period being allowed for the inventor to try whether the sale be remunerative, and when he has ascertained that it is remunerative he will pay in one year's duty to the local authorities.

If from the trial made during the first six months the sale turns out to be unremunerative the application may be withdrawn at the option of the patentee, but in case such application be made after the expiration of the six months, the duty for one year already paid in advance will not be returned. The applications sent into the Home office will receive consideration according to priority of arrival.

Where the invention of another has simply been improved, the application must distinctly state the name of the original inventor and the nature of the improvement. Where the invention in respect of which an application is made resembles a prior invention by another individual, but actually differs in construction or use, the points of difference must be clearly laid down in the application.

No patent will be granted for articles of general convenience, though the inventor be known beyond the possibility of mistake, and be yet alive, if the invention has been in general use for several years previous to the application.

Separate patents will not be given to each individual who may have combined with others to produce an invention, but a single patent will be issued in the name of all the partners of the company.

The owner of a patent may freely dispose of it for such sum as seems fit, during the period for which it has been granted; and both parties shall make application to have the fact endorsed upon the patent. The patentee is at liberty to establish branch shops in his own name, or to teach others how to make the articles patented by him. Should the patentee die before the patent expires, he may leave the patent to a relation, but application must be made to have the transfer endorsed thereon.

The Home office shall publicly notify in each case that a patent has been granted to such and such a person, of such and such a place, giving also the names of the department, province, and the seat of the local authority, in consequence of his having invented such and such an article. Should the patentee incur such losses during the term of years as he is unable to make good, if the article after due inquiry is found to be of indispensable public necessity, an extension may be granted. Each separate article must bear the words "by Government sanction," together with the name of the inventor. Fines shall be imposed on persons who fraudulently make use of a patentee's name, or who, not being in the enjoyment of a patent, make use of the term "by Government sanction."

A PATENT POISONOUS PAVEMENT.

Tripler's patented process for preventing rot in wooden pavements consists in saturating the wooden blocks with chloride of arsenic, or arsenic and chloride of sodium. The bottom planking and the sand between the blocks are also to be saturated with the same material, which is antiseptic and preserves the pavement from decay. It seems to us that the remedy is worse than the disease. Think of arsenic dust as an addition to the ordinary pavement dirt, wherewith to fill the mouths of citizens!

KEY SEAT CUTTING MACHINE.

The accompanying engraving represents an improved machine for cutting key seats in the center holes of pulleys and gear wheels. A is the table on which the wheel, B, through which the seat is to be cut, is placed. The work is firmly held by the binder, C, placed above it and around the upright bolts, D D. The binder is secured by the washers, E E, which are made open at one side so as to be readily slipped on the upright bolts, and are firmly held by the nuts as shown.

The compound crank, F, in connection with the slotted arm, G, and pitman, H, receiving power from the main pulley, actuate the vertical cutter or saw, I, passing through the center hole of the wheel or pulley to be cut. The saw is pressed up to its work by means of a lever, the handle of which is seen projecting at the right hand of the illustration, which is hung upon a pin at the back of the machine. The manner of fastening the saw in the apparatus, so that it may be easily attached or detached, is more clearly represented in Fig. 2. The block, J, has two trunnions, K K, through which set screws, L L, pass and screw into conical sockets on the saw. The block has a wide notch at the point where the screws meet to admit the saw between them, and is mounted on bearings in the saw gate so as to oscillate on the trunnions when the saw swings forward to form the slant or draw of the key seat. The back of the saw bears against the bottom of the notch, so as not to oscillate on the points of the screw.

By the arrangement of gearing communicating motion, a slow movement of the saw when performing work is obtained, at which time the pressure of the lever is applied. On the return stroke, which is rapid, the lever is slackened so as not to injure the saw teeth. By this device, the machine can be run much faster than if the motion of the saw were uniform.

This invention may be seen on exhibition at the warehouses of Messrs. Charles Place & Co., No. 60 Vesey street, New York city. It will doubtless prove a valuable and labor-saving tool in the machine shop. Patented through the Scientific American Patent Agency, October 15, 1872, by Messrs. T. R. Bailey & Vail, to whom further inquiries regarding rights, sales, etc., may be addressed at Lockport, N. Y.

ANOTHER TERRIBLE BOILER EXPLOSION IN OHIO.

We printed, on page 322 of our current volume, a letter from an engineer residing at Youngstown, Ohio, describing an appalling boiler explosion which took place near that place about a month previous to the date of the letter. The double fulcrum levers to the safety valves, shown in our illustration to the letter, were pointed out by our correspondent as most faulty arrangements, and were so considered by us in our remarks. We now hear that the boilers were repaired, the destroyed parts of the damaged ones being replaced with new plates, and some entirely new boilers being put in to restore the set of ten boilers *exactly to their former condition*.

About three weeks after the calamity above mentioned, a second explosion, of two of the boilers, occurred, killing two firemen on the spot and severely wounding five or six others. There is reason to believe that the water supply was not deficient, as the gage cocks, five minutes before the explosion, indicated plenty of water. Steam was blowing off at the safety valves, and the fires were going down, the engines being stopped. It is stated that, when the boilers were refitted after the first explosion, they were suspended to four beams, instead of three as shown on page 322, the two inner beams being made of cast iron. One of the cast iron beams broke, and the strain on the boilers, which are supposed to have been thus resting on the mud drums, created cracks, which could not be seen, as they were in the bottom plates of the boilers.

Our correspondent points out the danger of setting boilers in this way, as the slightest settlement of the walls on which the beams rest may cause the boilers to touch the surface beneath, and so be strained; and boilers 50 feet long by 3 feet diameter, as in the present case, might be seriously damaged without any fault being visible until a catastrophe, such as the two commented upon, reveals the terrible fact.

EVERY MECHANIC AND ARTISAN whose employer does not take the SCIENTIFIC AMERICAN should solicit him to subscribe for 1873.

A Spectral Face.

The picture of a man's head that graced the window pane of a house at North Beach, and created a marked sensation in this community, says the San Francisco Bulletin, is eclipsed by a fresh phenomenon at the dwelling house, No. 120 Valencia street. The head of a man, with black, curly hair, and sad, thoughtful countenance, has appeared on the bow window of the house, and is so clearly defined as to attract the attention of people passing along the street. It said that a handsome young lady has been in the

habit of sitting at the window during afternoons, and that a gentleman living on the opposite side of the street, becoming enamored of her, stood at the window of his room for hours, gazing upon the fair charmer, and thus the picture was formed. An excellent view of the picture may be obtained from the street.

We would inform our contemporary that New York can

B, or inclined as represented shaded. The ledge on which the instruments, water cup, etc., are placed, is connected by a rod to a lug on the standard, and always remains horizontal. The entire apparatus may be lowered so that the artist can work sitting, or the standard may be lifted to its full height, secured by the thumb screws shown, and the desk allowed to fall so as to form a perfect easel. By means of a collar on the spindle, the table may be turned to bring either side in front, so that the light on the work may be instantly altered by a mere touch. In the ledge are provided two commodious drawers for working materials, etc. The desk is mounted upon casters, handsomely finished in hard wood, and forms a pleasing ornament to the work room.

The engraving given herewith was drawn upon one of these tables, our artist expressing himself much pleased with the convenience and efficiency of the invention.

Patented May 21, 1872. For further information address Mr. M. P. Higgins, superintendent of the Washburn machine shop connected with the Technical Institute, Worcester, Mass.

Streeter's Carriage Indicator.

An admirable invention, intended to do away with the check string and speaking tube in carriages, has been patented by Mr. Streeter, of Conduit street, Hanover square, London. It consists of two dials, one placed inside the carriage, and the other on the dash board. The handle of the dial inside is connected by a chain with the outer dial, and by a simple and instantaneous motion directions can be telegraphed to the driver. The attention of the latter is attracted by a gong or bell, and by glancing at the dial he can tell whether he is to "stop," "turn to the right" or "left," "go slowly," "go fast," "proceed home," etc. In carriages used by professional men, the word "hospital" or any other can be inscribed on the dial. Mr. Streeter has also made a somewhat similar arrangement applicable to domestic purposes, by which servants may be summoned to "open the door," "bring hot water," "attend to fire," "serve" and so forth. In country houses, or in large establishments, much time and trouble may be saved by the use of the indicator, which may also be recommended for its simple arrangements and economy.—Public Opinion.

REMARKS.—This is not very much of an improvement after all. Two dials, with handles connected by chains, and a gong is an expensive and complicated substitute for a check string or a simple speaking tube. By the use of the latter, directions of any kind, night or day, can be readily given to the driver; but it would be difficult for him to see the pointer on a dial in the dark.

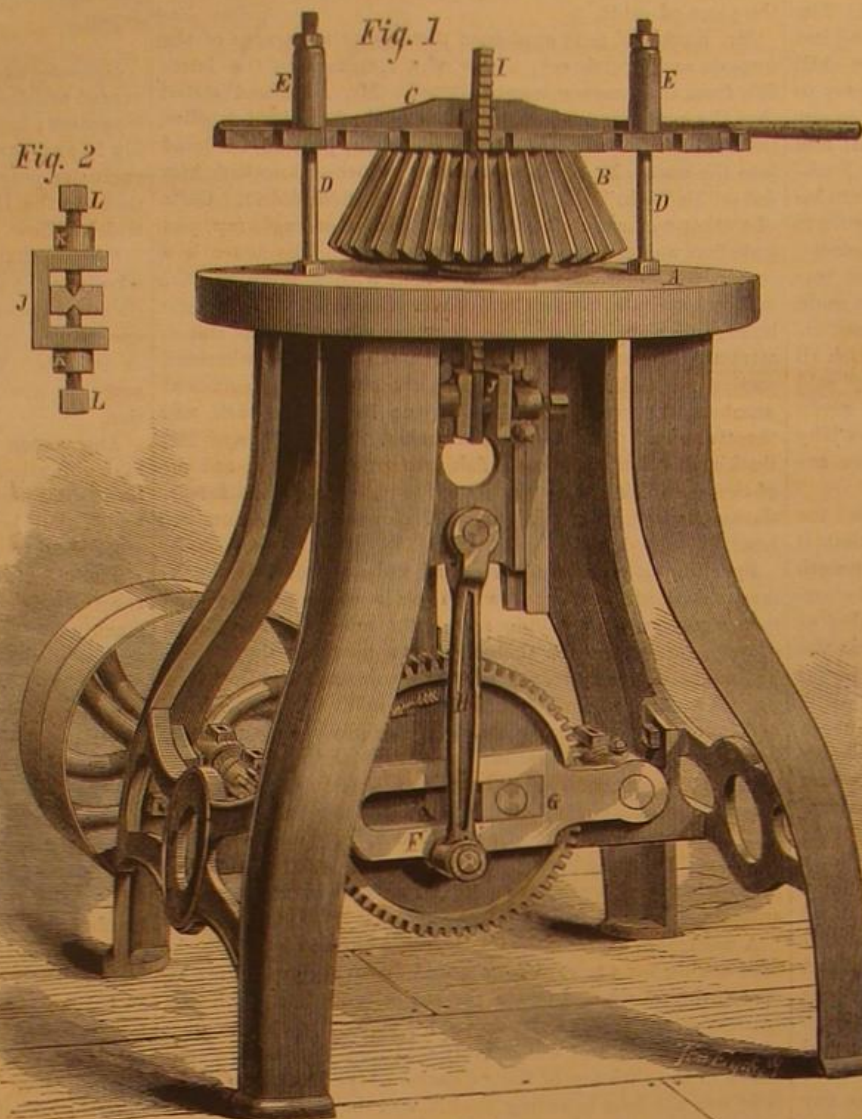
As to the use of the new device for domestic purposes is it not better to let the hot water run up stairs in its own pipe, instead of calling the servant by the double dial and gong arrangement? and is it not better to have a bell pull at the door so that the visitor may ring the bell at once instead of putting the parlor people to the trouble of summoning the servant, by operating the gong after the door knocker has been heard? Furthermore, is not the speaking tube the most convenient for quietly conveying orders below stairs, than any such clumsy machine as the above? Come over here, Mr. Britisher, and look at some of our admirable household conveniences and don't waste your time and talents on double dials, chains and gongs to whisper with.

Quick Telegraphing.

The President's Message reached the telegraph office in Washington at twenty-five minutes past one o'clock. Within forty-five minutes, the shortest time ever attained with so long a document, it was transmitted to New York, Philadelphia, and Baltimore. Twelve wires were used and the weather was favorable for working purposes. There were 11,339 words in the message. Within four hours after leaving Washington it was published in full in the evening papers and sold about the streets in this city.

PERSONS living in cities and large towns can obtain the SCIENTIFIC AMERICAN at the counter of any enterprising newsdealer in their place. It is commendable to patronize your local news agents by subscribing through them.

THE University of the City of New York announces a course of lectures, to be given in the small chapel, by members of the Faculty of Instruction. They will take place on Thursday evenings, as follows: December 5. *The Origin of Modern Science*, by Professor John W. Draper, M.D., LL.D. December 12. *The Solar Protuberances*, with illustrations, by Professor Henry Draper, M.D. December 19. *The Stability of the Solar System*, by Professor George W. Coakley, LL.D. January 2. *The Ancient Oriental Monarchies*, by Rev. Howard Crosby, D.D., LL.D. January 9. *Traditional Social Controversies*, by Professor E. H. Gillett, D.D. January 16. *The Scientific Relations of Prayer*, by Professor Benjamin N. Martin, D.D., LL.D. January 23. *The Colonial System of the Ancient Greeks*, by Professor Henry M. Baird, Ph.D. January 30. *The Structure of the Appalachian Chain*, by Professor J. J. Stevenson, Ph.D.

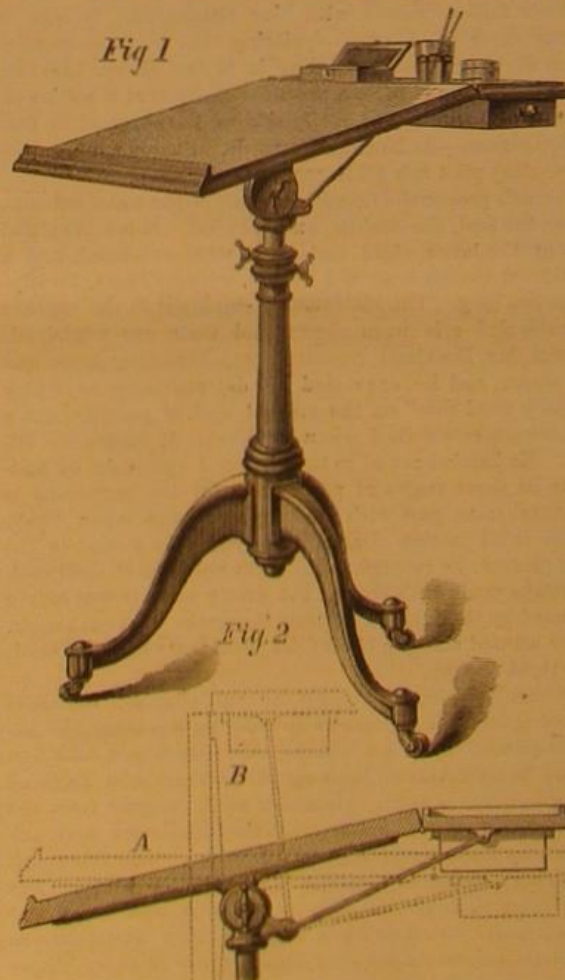


KEY SEAT CUTTING MACHINE.

beat San Francisco in spectral faces at any time. We have regular professors of the art, who for a fee of five dollars will call up the spectral faces of your departed friends, without glass, and make them smile and speak.

IMPROVED DRAWING TABLE.

The device which we herewith illustrate will be gladly welcomed by draftsmen and artists generally. It consists of a drawing desk or easel so arranged as to be readily placed



at any required inclination or height. Its support is composed of a tripod surmounted by a hollow standard in which slides the spindle sustaining the desk. The portion of the latter, on which the work rests, can be vertically rotated on its attachment to the standard, and as shown in the dotted lines of Fig. 2, either laid horizontal, as at A, vertical, as at

THE NEW PRUSSIAN RIFLE.

Very little information has reached this country with reference to the new rifle selected by the Prussian Government for the armament of its troops, and we therefore give engravings for which we are indebted to the *Engineer*.

Fig. 1 represents the breech open for loading; Fig. 7 the arm at half cock, or, more correctly, in a position of safety. The rest of the engraving illustrates details. In many respects the rifle resembles the Chassepot of 1866. The shoe of the breech, A, carries within it the cylinder or breech piece, C, which is perforated for the striker, F. The breech piece is worked by means of the lever, L, in the manner of all such guns. It is furnished with a guide block on its upper surface—like the Chassepot—which works between the two lips of the shoe, and which prevents rotation of the breech piece until the guide is clear of the lips or slot. The striker, F, is permanently attached to the cocking piece by the nut, S, and screw, Q, and this cocking piece can only move backward and forward without rotation, in consequence of the following arrangement: The striker is elliptical in section, as shown in the Figs. 3, 4, 5, which are taken at corresponding places in the striker; the face or movable head, M, of the breech piece is, moreover, detached from the breech piece, consequently the rotation of the cylindrical breech piece in opening and closing does not affect the position of the striker and its adjuncts. The striker is surrounded as usual by a spiral spring, G. The rear end of the breech block acts on the cocking piece by a kind of cam action, shown in detail in Fig. 2, and the object of this will be explained further on.

The extractor, shown in Fig. 3, and in section at Z in Fig. 6, works in a groove in the left side of the shoe, and its position in the movable head of the breech block is shown in Fig. 4. K is a supplement to the extractor, and is called the ejector. It is mounted in the trigger spring, B, and works through the shoe. Its function is to throw the extracted case out of the breech. A safety catch, N, is fitted to the cocking piece. It works upon a spring, like the back sight of a rifle, and when in use drops into the notch in the breech block, and prevents the striker reaching the cartridge.

The action of the gun is as follows: The breech being open as in Fig. 1, the cartridge is inserted, the breech block pushed forward till its guide is clear of the slot, then it is turned to the right, by which the breech is closed. The nose of the cocking piece is then bearing against B, and the striker spring is consequently compressed. The pressure on the trigger releases the striker which, impelled by the spring, fires the cartridge.

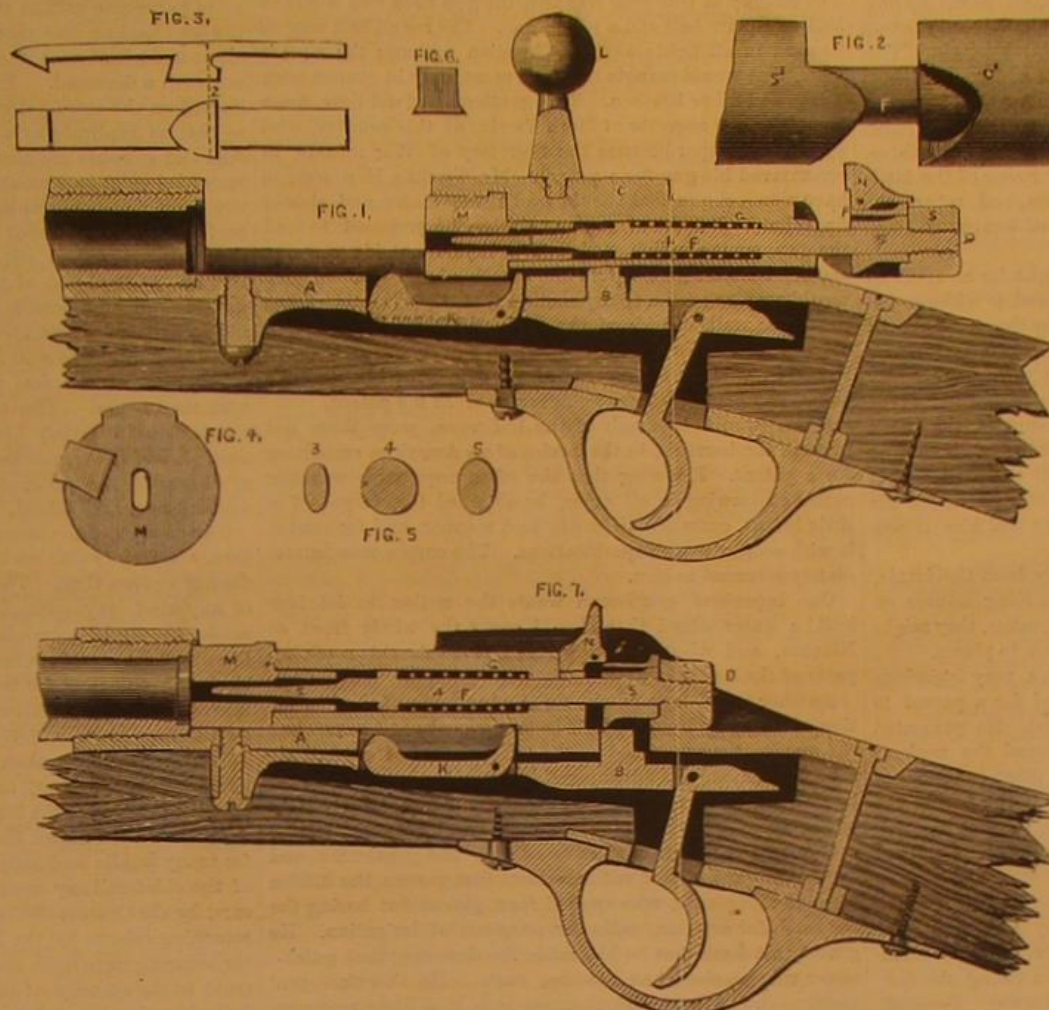
To open the breech and load again, the lever is turned from right to left; the head of the breech block and the cocking piece remain in the same position, for the reasons above given. The cam, C', of the breech block forces back the cam, S', on the cocking piece, and cocks the gun. The breech block is then drawn back; the extractor draws out the empty case, which, striking violently on the claw of the ejector, K, is thereby thrown out of the shoe. It will be noticed, from its form, that the ejector is acted upon through its rear claw, that nearest its pivot. A groove is therefore cut for it in the lower part of the breech piece, and it results that the front claw never projects except when the breech piece is drawn back.

A NOVEL RAILWAY FERRY BOAT.

Mr. Alfred Goddard, of Hastings, England, has designed a new steamer, intended as a railway ferry boat for the English Channel. It is described as follows in the *Engineer*:

The form proposed is two cylindrical hulls 500 feet long and 25 feet in diameter, connected by transverse girders 80 feet long, which would be the extreme width of the vessel, and form between the hulls a platform deck 400 feet long and 30 feet wide. This deck, so far as covered in by an upper deck 240 feet long, to be close planked, with a central line of rails for carriages and to contain saloons, cabins, etc., for passenger accommodation.

The parts of the deck beyond the inclosed, extending 80 feet each way towards the end of the vessel, to be laid with open jointed planking, under which, commencing from the extreme ends, is a breasting extending back the above 80 feet, and curving down to within 3 feet or 4 feet of the water line, as shown at A, on the outline sketch of half length. This breasting to be of close or open planking or iron work on the under side, as might be found best on trial, for taking the run of the seas between the hulls, the steering apparatus being formed under each of the breastings. The vessel is intended to work either way, both ends



THE NEW PRUSSIAN RIFLE.

being alike; the hulls to contain engines, cargo, etc. From the above partial description of a vessel the author proposes the following questions:

Would the hulls, taking such long bearings on the water compared with their small diameter and circular form (see outline of section), be affected in respect of steadiness by heavy seas to so great a degree as a fuller or more wall sided or flatter floored vessel, whether single or double?

Looking at the power as well as the length of the vessel,

It is the intention of the publishers of the *SCIENTIFIC AMERICAN* to make the paper next year better and handsomer than any previous year during the more than a quarter of a century it has been published.

Coach Painting in London.

An American gentleman, from this State, recently wrote to C. S. Windover, the celebrated coach builder, Huntingdon, England, inquiring his system of painting a carriage body, from the time it leaves the workshop to the time it is finished. The following answer was communicated to *The Hub*, and appeared in the number of that journal for November 15, over the signature of "An Old Spoke."

"When a carriage body is finished from the hands of the woodman, and passes into the paint shop, it is nicely cleaned off, and receives in succession three coats of lead color, one coat each day, the color being mixed with gold size and oil, but with no dryers. After being thus primed over, the body receives three coats of the best filling, in three successive days. It is then faced down with dry pumice, after which it receives three more coats of filling, in all six coats; and in the case a brougham, one extra coat to the upper quarters, on account of their being covered with leather. The filling is mixed with varnish only, no size or any other ingredient being allowed. The whole is then rubbed down in the usual way and lead colored, after which it is faced, and the surfacing process may be said to be completed. The preparation colors are then put on, and the body finished, the full details of which I suppose no reader of *The Hub* now wants to know, so much having been written on the subject in your pages, both as to the English process and the American. It may be worth while, however, repeating here that before the last coat of varnish is laid on, the

whole surface of the body should be flatted over with rottenstone, which, being closer than pumice, fills the pores of the preceding coats, and makes a solid surface whereon to lay the last coat, which will bear out like the face of a looking-glass.

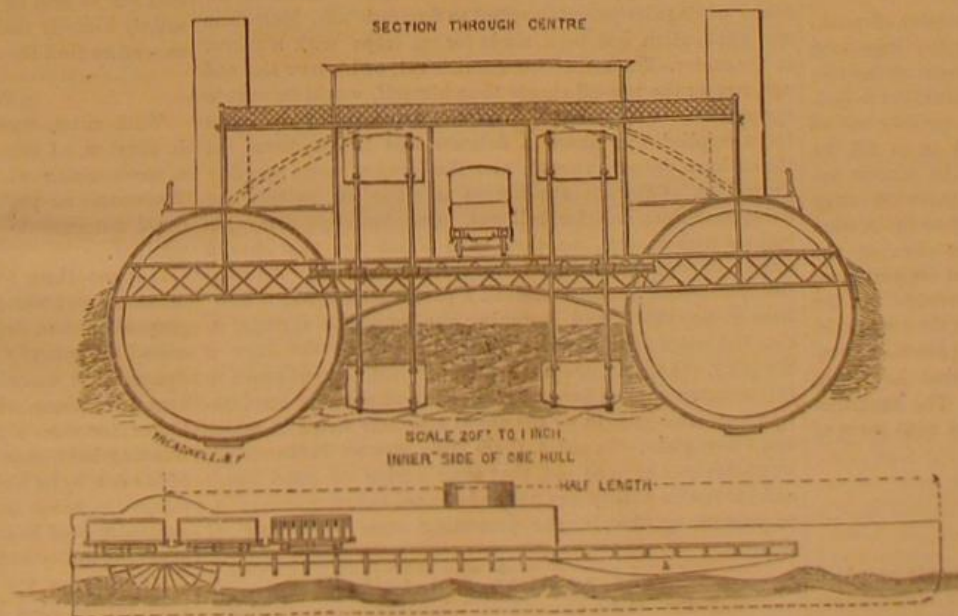
"What Mr. Windover considers the advantage of his system of painting is, that it begins and ends with varnish, which at once gives a good surface, and from the first lays a solid foundation, which cannot be secured by the use of turps and dryers. All his colors are ground in varnish. The carriage work receives four coats of color, one coat of varnish color, and is finished with three coats of clear varnish.

Coffee and Tea Reservoirs for Firemen.

Some one, says the *New York Times*, writing to a scientific journal, proposes a plan for making buildings absolutely fireproof, which consists in constructing metal lined reservoirs in the walls and roofs, to be filled with water. Of course, water will not burn, and the inventor therefore claims that his water lined houses will be protected against the flames, except in cases where the heat of a contiguous fire is so great as to convert all the water into steam. The invention may be good so far as it goes, but it is certainly susceptible of considerable improvement. Why, for example, need the walls be filled with water only? They might, with equal safety, be made reservoirs of lemonade, coffee, or tea, and constructed with taps, so that the owner

could have a beverage ready at his hand whenever he should be thirsty. The lemonade would be drinkable in ordinary circumstances, and in case of fire the tea and coffee would be heated so as to be fit for the refreshment of firemen. Naturally, coffee so prepared would not be of the best quality, but then most of us have been compelled to drink so much bad coffee that we should probably find it rather an improvement on the sort of article furnished by our landlords.

In the *Revue Chimie*, M. Müller describes a process of forming ornamental and useful objects of pure silica. The pure silica is reduced to an impalpable powder, formed into a paste, and molded. When heated to bright redness, the grains fuse together, become very coherent, and form objects of great durability.



A NOVEL RAILWAY FERRYBOAT.

would not her long bows, which finish with upright stems, cut through and break the seas to a great extent, and, with the breasting above described running over them, reduce them so far as to prevent their washing the under side of the covered portion of the platform deck, give the paddles constant and even play, and add to the steadiness and equilibrium of the vessel by causing the water between the hulls to be comparatively even for full two thirds of their length? The windward hull would act to some extent as a breakwater, its form, as above noticed, causing it to receive the concussion of the seas with comparatively little disturbance.

Supposing an extreme case, in a gale with the wind abeam. Would not the vessel, by being headed a few points to windward of her course, be steadier than a single hulled vessel of the same tonnage in the same circumstances?

PATENTS.

The amount of misapplied talent engaged on inventions that can never be used is as wonderful as it is prolific. There is a ludicrous element in many of the patents, and more of the applications, which is well worth investigation; and we extract from the records of the Patent Office, an account of some of these, that show more genius than common sense, and have produced more laughter than profit.

In 1870, the owner of certain beehives, irritated by the loss of his honey by the bee moth, asked for a patent for a combined hen roost and beehive. He had noticed that the beemoth travels at night, while the busy bee works by day. His desire, therefore, was for a device that should admit the worker by day, and keep out the thief by night. This his ingenuity effected by the erection of a hen roost pivoted upon a beehive provided with gates. The bees were expected to be in their cells just before dusk; the hens lighting on their roosts, were then to close the gates of the hive, and keep them shut all night. The early rising of the fowls would automatically open the gates again, and return the bees—their honey all safe—to the airs of heaven and the flowers of earth. He received his patent.

Another applicant asked for a patent right for an artificial moon, that should light each town that used it without expense. His eye had often been struck by the reflection of distant windows at sunset, and how far that light traveled. He therefore proposed a balloon for each town, sufficiently large to raise a huge reflector that was to be hoisted every evening at dusk (about the time the hens shut in the bees). The reflections of the sun's rays, cast downward upon the village, was sure to light it through all the darkness of night. Fortunately for himself, this inventor presented his application through a patent attorney, who told him it was doubtful if it could be obtained.

In the fall of 1871, a gentleman, probably from California, applied for and received a patent for building houses on wheels or rollers, so that, in case of earthquakes, they might roll forward or backward, but not be shaken to pieces.

Only three years have passed away since a very ingenious gentleman from the rural districts applied for a patent to prevent cows from switching their tails! He presented two models—one shaped like a bottle, around the neck of which the cow's tail was to be curled; the other consisted of a square block, with a hole through the center, wherein the tail was to be put, and then tied in a knot, so that the animal could not withdraw it. On the presentation of the application, the official examiner thought it could not be granted because of a similar device in "Don Quixote," where Sancho Panza, trying, to sleep in the hay loft, was kept awake by the braying of his donkey below. His wakefulness gave Sancho time to reflect that, when riding the donkey, the animal switched his tail when he brayed. Descending hastily from the hay loft, the squire tied a block to the donkey's tail to prevent him from braying. But as this device originated with a Spaniard, and had never been repeated in this country, the office decided to grant the patent. Our readers will, therefore, remember that they cannot tie a cow's tail to prevent its switching without a payment of royalty to the owner of this privilege.

If "Don Quixote" anticipated one of our American patents, Coleridge's "Ancient Mariner" performed the same office for another, when he says:

"The air is cut away before,
And closes from behind."

Noticing how vessels are delayed by the necessity of pushing aside the water that obstructs their way, an ingenious gentleman asked for a patent for putting in front of the vessel a series of hollow wheels, whose blades should act as paddles. These wheels would lift the water so speedily out of the way that the vessel would have to rush in to fill the void. This motion of the vessel would give the wheels another turn, and then the wheels would once more lift away the water, and thus draw the vessel on. And so the motion of the vessel would turn the wheels, and the turn of the wheels would draw the vessel. This applicant for perpetual motion was so certain of success that, to provide for the only difficulty he could foresee—which was in the two rapid motion of the vessel, that would tear itself to pieces—he provided an anchor, with a spring cable to it, that he might check the vessel from its too rapid speed. The examiner however, might have given his decision in the next verse of the "Ancient Mariner:"

"Fly, brother, fly! more high, more high,
Or we shall be belated;
For slow and slow that ship shall go,
Till the mariner's trance is abated."

An applicant for a patent for wooden pavements proposed to mount each block of wood on springs. He claimed that this would remove all jar in riding, and obviate the necessity of springs on carriages.

Another gentleman applied for a patent for heating canals, by steam, so that boating could go in winter as well as in summer. The office decided that this invention was worthy of protection, and gave him his patent.

Another applied for a combination of clock and bed, so ingeniously contrived that, when the clock struck, the bottom of the bed dropped out. He claimed that this plan would probably awaken the sleepers.

Speaking of combinations, he must have come from Missouri or Kansas who asked for a patent for a combination of cannon and plough. For this purpose he filed three applications, making the elongated handles of the plough hollow, so as to form two cannons. These were to be kept loaded till the guerillas were after him; the cannons were then to be fired, the guerillas shot down, and the farmer to go on his ploughing way rejoicing.

And he, too, must have come from the borders who asked for a patent of a combination of trunk and house. The trunk was made with triple slides, moving up and down. Doing duty all day in guarding clothes, when night came on, and no cabin near, the goods were to be taken out, the triple walls elevated into one, and the benighted traveler safely housed.

As early as 1718, Mr. James Pashille patented a swivel gun in England, with the motto

"Defending King George, your Country and Laws,
Is defending yourselves and Protestant cause."

The novelty of this plan was that his gun fired two kinds of ball—a square ball and a round one. The round ball was to be used in all fights against Christian nations; the square balls, that would mangle the flesh more, only in contest with Turks and other heathen. This gentleman of old time must have been the ancestor of Mark Twain, of this country, who so lost his temper because the Secretary of War refused to recommend his gun for a patent. Mr. Twain's idea was, to have a swivel gun that should load at the center and should fire off at both ends. In case of a siege, he proposed to load the gun, set it a whirling, and drop it just outside the city walls. Before the balls left the mouth of the cannon, they would acquire such a rotary motion that they would sweep round the walls outside of the town, killing off all the besieging host. We must acknowledge, however, that we have looked in vain, on the records of the office, for Mr. Twain's name, and hence we infer he never received his patent.

There would be much of the ludicrous, were there not more of the horrible, in the device of an American embalmer for a patent. Knowing that the office required a working model or drawing in all cases, he obtained the corpse of a little infant, embalmed it in his best manner, and forwarded it with accompanying specifications. The corpse was immediately returned to him.

One ingenious gentleman wants the nation to let him build a water wheel that should cover the whole front of Niagara, and whose shafting and power should reach all parts of the land.

Another asked for a patent for the invention of the generation of steam by boring a hole in the ground until he reached the waters that are boiled by the internal fires of earth. He set forth, among the advantages of his plan that there would be no danger of explosions, no expense for fuel, no necessity of engineers—all of which statements are undoubtedly true.

It must have been a relative of this last gentleman, and one equally acquainted with the laws that govern the hidden heart of this planet, who applied for a patent for boring the earth for artesian wells for purposes of irrigation. He gravely set forth that he had made the discovery that quicksilver was heavier than common earth. He therefore proposed to start a hole, and to empty into it a little mercury. By the laws of Nature, that mercury would be sure to work its way downward till it struck water, and the water would then be sure to work its way upwards till it struck air.

Should it be said that such patents as this last, as that for the prevention of cows' switching their tails, for artificial moons, for ploughs doing the work of cannon, etc., must be jokes, we can only reply that shrewd Yankees are not wont to pay thirty-five dollars even for practical jokes, and that none of these designs have culminated into patents under less than that sum, and, when attorneys were employed, under double and quadruple that sum.

The *Journal* (Appletons) is not large enough to contain the account of singular patents applied to domestic use. More than one application has been made for rat traps with a mirror in the center. The rat, seeing another rat, of his own size and age, nearer the toasted cheese than himself, would be sure to spring for it. There have been quite a number of tapeworm traps applied for, where a delicate bait is let down the throat by a delicate thread, and the hungry worm speedily drawn up. Constant application is made for patents for flying machines and for balloons. One contriver arms his balloon with cannon, another with Greek fire that should burst and explode when just over the hostile army. An English gentleman actually received a patent for putting a howitzer on horseback, and mounting the horse on springs, so that the recoil of the howitzer should not break the legs of the pony. And, as late as September last, a gentleman in this country applied for and received a patent for accelerating vegetable growth by the use of alternate strips of white and violet glass. In short, there is no idea so ludicrous, so wonderful, or even so old, that some person of good sense and inevitable ability has not endeavored to throw around it, or something like it, the protecting aegis of the law of patents.

The American Seal Lock.

During the recent election at Wolverhampton, England, says the *London Times*, the ballot boxes employed were secured by an American invention, the Patent Seal Lock, which was several times mentioned in our columns in the summer in connection with the robberies from the luggage of continental railway travelers that were then so much complained of. The seal lock is one in which the key hole admits of being completely covered by a sliding metal plate, which, when pushed fully into its place, is retained there by a spring catch. In this plate there is a small hole, through which the catch may be pressed back by a pin attached to the key, and the plate can then be drawn down so that the keyhole is exposed. The plate is counter-sunk to receive the "seal," which is a small square piece of glass, held in position, when the plate is pushed home, by the grooves in which it slides. The seal, therefore, covers the hole through which alone the spring catch is accessible, and this cannot be released until the seal is broken. So long as no seal is inserted the lock remains an ordinary lock, fit

for all ordinary purposes. When the security given by the patent is desired, a seal is dropped into the place prepared for its reception before the sliding plate is closed. When this has been done no one, neither the owner nor any other person, can apply the key until after the seal has been destroyed. So long as the seal is intact there is absolute certainty that the lock has not been tampered with.

The seal itself is a piece of common window glass marked with a letter and number, and also with various irregular dots and splashes, in a sort of chocolate color. These marks are backed up by a white ground, and the whole is burnt in, so as to become part of the glass, and indelible. Each seal is about half or five eighths of an inch square, and a large sheet is made at once, the separate seals being afterwards cut out with a diamond. The lettering and numbering are conducted on this same principle as on Bank of England notes, so that no duplicate of a seal will ever be made; and the dots and splashes are accidental in shape and position, being sprinkled on at hap hazard. Before the seals are cut the entire sheet is photographed, and the printed photograph is perforated like a sheet of postage stamps. The purchaser of the seals is supplied also with photographic fac-similes, so that he can send one of these, and not only the letter and number, to any person whose business it may be to verify the security of a package. For example, goods consigned to a distance might be sent in a box with a sealed lock, and a photograph of the seal might be enclosed to the consignee with the invoice. The consignee, on producing his photograph, would satisfy himself that the lock had not been opened, and the carrier would be relieved from the possibility of claims for the loss or abstraction of goods which the package had never contained.

The essence of the security which the seal affords is, therefore, a certainty that no key has been inserted into the lock during a given time. The principle may be applied to a lock of any kind, any strength, or quality. What it does is to render the keyhole inviolable, or, at least, to show that it has been inviolate. Of course, the seal is easily broken, a smart tap being sufficient for the purpose; and it is protected on this account in the padlocks manufactured by the patentees by a strong cover which fastens down with a spring catch. When the seal is broken no proof is afforded that the lock has been opened; but, as long as the seal is entire, there is positive proof that the lock has not been opened.

In the United States the seal lock is extensively employed for many public and private purposes. It is used by some of the chief railway companies for the protection of their cars, by the Custom house for goods bonded or in transit, by returning officers for the ballot boxes, and by private persons for securing important matters which it is necessary to intrust to the custody of others. A box of deeds or papers left with a banker or lawyer, and a plate chest or wine cellar left with servants in the absence of the proprietor, may serve as illustrations of such uses. For deed boxes the arrangements for affixing the seal are peculiarly neat, not to say ornamental in their character.

The value of the seal lock depends entirely, as a matter of course, on good workmanship, and on the impossibility of releasing the spring of the sliding plate in any other than the way intended by the maker. If the plate worked loosely in its grooves, there might be means of getting at the catch in some illicit manner, or it might be possible to file or drill away some channel for the same purpose. But the most that can be said of this possibility is that the owner must satisfy himself that the metal work of the lock is uninjured, as well as that the seal is unbroken.

PHINEAS L. SLAYTON.

With much regret we record the decease of Mr. Phineas L. Slayton, of this city, in the 52d year of his age. He was a mechanic of remarkable genius and practical ability. There was no problem in mechanical construction that he could not execute in the most workmanlike and scientific manner.

It is one thing to invent a device, but quite another, and often more difficult, to construct a new machine, design, proportion, and erect the novel structure. Mr. Slayton possessed the gift of doing both. He was the builder of many complicated machines for other people, while among his own inventions which he put into actual operation were looms for weaving hair nets, for knitting Scotch caps, for weaving hats, machines to make brushes, etc. At the time of his death, he had almost completed a machine for making cigarettes, those little rolls of tobacco in paper that are so generally used in Cuba and Mexico. This machine involved great ingenuity and nicety of construction.

Mr. Slayton was an intelligent, industrious, unassuming man, gentle, kind hearted, pure minded. Esteemed for his manly integrity by all who knew him, greatly beloved in his home relations, his life was in all respects a noble one.

Do NOT overlook the fact that a single weekly number of the *SCIENTIFIC AMERICAN*, costing six cents, contains as much matter as most of the monthly magazines which are sold for 35 cents.

WIARD CANNON.—At Nut Island, Boston harbor, preparations are now being made for a trial of heavy guns, designed by Norman Wiard, one smooth bore and the other rifled. These guns weighing 20 tons each, are of 15 inches caliber, and 48 inches in diameter at the breech, and 25 inches in diameter at the muzzle. The guns are to be fired at targets placed on the shores of other islands in the harbor.

IT IS THE INTENTION of the publishers to illustrate, by superb engravings, all new and practical inventions and discoveries that may be developed during the year.

DECISIONS OF THE COURTS.

United States Circuit Court, Eastern District of New York.

TARR *et al.* vs. WEPB.—PATENT FOR PAINT FOR SHIPS' BOTTOMS.

BENEDICT, Judge:

This case comes before me upon a motion for an injunction to restrain the defendant from making and vending a certain kind of paint used to protect ships' bottoms from worms, which is claimed to infringe upon a patent owned by the plaintiffs.

This patent was originally issued November 3, 1863. It was reissued in 1867, and again reissued in two divisions October 17, 1871. One of these divisions, designated as Division A, Reissue No. 4,598, is the patent relied on by the plaintiffs. The other is not in controversy here. The claim of this patent is as follows:

What we claim is a paint consisting of oxide of copper with a suitable vehicle or medium, substantially as described.

This claim, read in the light of the specification attached, seeks to secure for the patentee any mixture capable of being applied as a paint in which oxide of copper is an ingredient. The patent is not for a process but for a compound which the patentee claims as his own discovery. In this compound two elements and no others are described as essential. There must be oxide of copper in the compound, and there must be a vehicle which will permit it to be applied to surfaces after the manner of applying paint. It is not pretended that any new property of oxide of copper is developed or brought into action by this manner of using it. Nor does the compound itself produce any effect not before known. All the benefit derived from the use of the compound arises from the poisonous effect of oxide of copper—an effect long well known.

So understood, the patent is invalid. It discloses no discovery to be rewarded. Oxide of copper and its poisonous effect have long been known. Compounds capable of being applied to surfaces in order to protect the same are in universal use, and there was nothing new in the idea that oxide of copper could in this way be applied to surfaces.

The effort of the patentee has been to secure the sole right to use oxide of copper in any form which renders it capable of being applied to surfaces after the manner of applying paints. A monopoly of the use of a well known substance in a particular but well known form cannot be secured. Strychnine will poison dogs; and some one may yet discover that it can also be used to poison the worms of the sea; but that will not entitle the discoverer to an exclusive property in all mixtures which contain strychnine and are capable of being spread on surfaces. Furthermore, it appears that in 1849, prior to the plaintiff's patent, Dr. Ure gave in his dictionary a description of a metallic pigment to be made with pure oxide of copper, which description would enable any one skilled in the art to make a compound similar in all respects and having the same qualities as the compound described in this patent.

This being so, the subject matter of the reissue, if it be patentable, cannot be secured to the plaintiffs, because it is not new.

A further objection taken to this reissue is that the subject matter of it is not to be found in the original patent. To which one answer made is that, under the patent act of 1870 it is not necessary, in the case of a chemical invention, that the subject matter of the reissue be found described in the original patent—that it is sufficient if proof be that the subject matter of the reissue was in fact part of the original invention, and the grant of the reissue is decisive that proof was furnished.

In view of the opinion I have expressed upon other branches of the case, I deem it unnecessary to notice this objection to the patent in question, further than to say that I am of the opinion that no such effect can be given to the act of 1870 as the plaintiffs claim, but that in the case of a chemical patent reissued it is necessary to its validity that the subject matter be found described in the original patent.

The motion for an injunction is denied.

M. B. Andrus and Causten Browne, for complainants.

Frede. H. Betts, for defendant.

United States Circuit Court, District of Massachusetts.

Important Decision Concerning Assignments.

ASHCROFT vs. WALWORTH *et al.*

SHEPLEY, Circuit Judge:

The patent in this case was granted to James R. Brown, November 30, 1858. Previously to this time, November 6, 1858, Brown had conveyed to one William Freedly, one half of his interest in the invention and any patent which might be granted therefor. On the 31st of March, 1859, Freedly conveyed his interest to Silas B. Goldthwait. The title stood one half in James R. Brown and one half apparently in Goldthwait on the 16th day of June, 1860, at which time James R. Brown went into insolvency under the law of Massachusetts.

It is claimed by the defendants that by virtue of the proceedings in insolvency all the interest which James R. Brown then had in the patent passed to George H. Kingsbury, his assignee. The insolvent law of Massachusetts authorized the judge, "by an instrument under his hand, to assign and convey to the assignee all the estate, real and personal, of the debtor, except such as is by law exempt from attachment, with all his deeds, books, and papers relating thereto;" and it provided that "the assignment shall vest in the assignee all the property of the debtor, which he could lawfully have sold, assigned, or conveyed, or which might have been taken on execution upon a judgment against him, etc., etc." and shall be effectual to pass all said estate, etc., etc., etc." Under this statute it has been decided that the property vests in the assignee by force of the statute rather than by virtue of the terms of the assignment (*Clark vs. Minot*, 4 Metcalf, 346, 348.)

The act of Congress of 1836, chapter 357, section 11, provides that every patent shall be assignable at law, either as to the whole interest or an undivided part thereof, by an instrument in writing, which assignment shall be recorded in the Patent Office within three months from the execution thereof. This act clearly contemplates a written instrument, signed by the owner of the patent and duly recorded in the Patent Office, as necessary to vest the legal title in the purchaser.

The insolvent law of Massachusetts provides, further, for confirming the assignment made by the judge by making it the duty of the debtor "to execute all such deeds and writings, and do all such other lawful acts and things as may be necessary or useful for confirming the assignment so made by the judge, and to enable the assignee to receive or become possessed of all the estate and effects assigned as aforesaid, especially such part thereof as may be without the Commonwealth." This is an express recognition of the fact that there may be property so situated in other countries or States,

or Territories, that the assignment itself would be ineffectual to pass it and transfer the title to the assignee without an instrument of conveyance from the debtor. Especially is this the case with patent rights, for, in the language of Mr. Justice Curtis, "these incorporeal rights (copyrights and letters patent) do not exist in any particular State or District; they are coextensive with the United States. There is nothing in the act of Congress or in the nature of the rights themselves to give them locality anywhere, so as to subject them to the process of courts having jurisdiction limited by the lines of States and Districts." (*Stevens vs. Gladden*, 17 Howard, 451.)

It might have been competent for the court under the insolvent law to have compelled the debtor to execute such an instrument in writing as, in accordance with the provisions of the patent act, would have been effectual to transfer the title in the patent to the assignee. If a right in a patent were such property as did not come within the exceptions of the insolvent law, as property not liable to attachment, or if it is of such a nature that it is subject to the operation of State insolvent laws, this would seem to have been the only proper and effectual mode to have made it available for the benefit of the creditors. Without such a conveyance as the statute of the United States contemplates, we do not think the assignee acquires any legal title to any interest the debtor may have in any letters patent. To invest the assignee with the legal title, the court must compel a transfer in conformity with the requirements of the patent act. (*Stevens vs. Cady*, 14 Howard, 531.) No title, therefore, vested in Kingsbury, the assignee, no such instrument in writing, assigning the debtor's interest to him, ever having been made and recorded in conformity with the requirements of the act of Congress.

The defendants did not acquire any title through the conveyance to Richard A. Brown and from him to Norton. Before the conveyance from Richard A. to Norton, he had reconveyed to his father, James R. Brown, and although that conveyance was not recorded it was good against Norton, for Richard A. only undertook to convey whatever right, title, or interest he had under the patent to manufacture the thing patented, not the patent itself or any undivided interest therein. Nothing passed but the actual interest the grantor had at the time. (*Brown vs. Jackson*, 3 Wheaton, 449.)

Norton was not a *bona fide* purchaser, but took the conveyance with full knowledge of the previous conveyances from Richard A. Brown to James R. Brown.

Plaintiffs are entitled to a decree for an account of the patented pipe tongs made, used, or sold by the defendants since the conveyance to the complainant, and for an injunction according to the prayer in the bill.

Decree for complainant for account and injunction as prayed for, decree to be drawn up and submitted to the court.

James B. Robb, for complainant.
C. Smith and W. W. Swan, for defendants.

PROFESSOR RAOULT, of Grenoble, has proved that nickel employed for twelve hours as a negative electrode in a voltameter, condenses at least 150 times its volume of hydrogen and abandons entirely this gas, when it is taken from the voltameter and plunged in water. M. Raoult has made several experiments on the production of caloric and has succeeded in demonstrating that the intensity of the heat developed by an electric current is independent of the system of battery by which the current is engendered.

NEW BOOKS AND PUBLICATIONS.

ROLL OF HONOR, NO. XXVII.; Names of the Soldiers, who died in Defense of the Union, interred in the National Cemeteries of Beaufort, S. C., Natchez, Miss., Vicksburg, Miss., and Pittsburgh Landing, Tenn. Washington: Government Printing Office.

VICK'S ILLUSTRATED FLORAL GUIDE FOR 1873. James Vick, Rochester, N. Y.

This guide is now published quarterly. 25 cents pays for the year, four numbers, which is not half the cost. The January number is beautiful, giving plans for making Rural Homes, Designs for Dining Table Decorations, Window Gardens, etc., and containing a mass of information invaluable to the lover of flowers. One hundred and fifty pages, on fine tinted paper, several hundred engravings, and a superb colored plate and chromo cover. The number before us is cheap at one dollar to any one who has a taste for floral matters.

THE NOTE TAKER, or the Elements of Tachygraphy. To be completed in eight numbers. Otis Clapp, Boston, Mass.

The first two numbers of this work are published in one issue, and contain a treatise on Linsley's system of brief writing, which should be read by stenographers, and especially by those desirous of acquiring a rapid method of taking notes of a speech.

COFFEE, ITS HISTORY, CULTIVATION AND USES. By Robert Hewitt, Jr. New York: D. Appleton & Co.

This is a most interesting little book, and we believe it will be acceptable to all readers. It is printed and bound in admirable style and in excellent taste, and is a credit both to the author and the publishers.

FACTS FOR THE LADIES.—Mrs. J. C. Thomas, Bloomington, Ill., has used her Wheeler & Wilson's Lock-Stitch Machine constantly since April, 1860, making the heaviest and thickest coats, such as beaver cloth. See the new Improvements and Woods' Lock-Stitch Ripper.

Herrings' Safes in the Boston Fire.

To the Editor of the *Scientific American*:
The owners of the Herring's Safes will be gratified to know that their reputation has been fully sustained by the recent ordeal in Boston, and that no valuables entrusted to their care have been lost.

Owing to the competition among local manufacturers, and past immunity of the place from extensive fires, our safes have never been offered for sale in that city, and the few that were exposed in the great conflagration were purchased by New York houses, and sent to Boston for use. How well they did their duty, let the following letters testify:

HERRINGS & FARREL,

Nos. 251 and 253 Broadway.

BOSTON, MASS., November 12, 1872.

Messrs. Herrings & Farrel, Nos. 251 and 253 Broadway, New York:
GENTLEMEN: In the "Great Fire" which has destroyed the business portion of this city, we had in use one of your "Champion" safes, and which we were unable to recover from the ruins this P. M., on account of the intense heat which surrounded it. When we opened it, we were agreeably surprised to find our books, papers, etc., in fine condition.

Yours, &c., J. C. BURRAGE & CO.

ANOTHER.

Boston, November 14, 1872.

Messrs. Herrings & Farrel:
GENTLEMEN: Our store, No. 38 Summer Street, was burned in the late "Great Fire" in this city of Nov. 9 and 10. Our books and papers were in one of your "Patent Champion Safes," and were all preserved in good condition. Our store was burned about 10 o'clock Saturday evening, but, on account of the heat, we could not get at the safe until the Tuesday following—over sixty hours later. We consider this fire no ordinary test for safes, and take pleasure in giving facts as above.

Very truly yours, FORTER BROTHERS & CO.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notice exceed Four Lines, One Dollar and a Half per Line will be charged.

Sewing Machine Needle Machinery, Groovers, Reducers, Wire Cutters, &c. &c. Hensley Bro's, Wolcottville, Conn.

For Sale or Exchange for Good Lathes—A Ferris & Miles Steam Hammer, 20 lbs. Stroke—nearly new. Wiley & Russell, Greenfield, Mass.

Patent Steel Measuring Tapes, manufactured by W. H. Paine Greenpoint, N. Y. Send for Circular.

\$150,000 profit by an important invention. Only \$1500 investment. Good references. Address A. D. P., 71 Essex Street, New York.

Gauges, for Locomotives, Steam, Vacuum, Air, and Testing purposes—Time and Automatic Recording Gauges—Engine Counters, Rate Gauges, and Test Pumps. All kinds fine brass work done by The Recording Steam Gauge Company, 91 Liberty Street, New York.

Steam Engines, Boilers and Pumps, Locomotives and Cars—New and Second Hand. Dulles & Co., 424 Walnut St., Philadelphia, Pa.

Wanted—A Partner or Company with Capital, about \$20,000 to \$25,000, to manufacture and sell Hafter-Hook-Fire-Escape-Ladders, as described on page 262, patented March 12, 1872. Great demand for it. Agents wanted. Address Patentee, C. G. Buttikerell, Toledo, Iowa.

I want to Buy a good Ice Machine. Address, with price, I. H. Smelser, Cleburne, Johnson Co., Texas.

Ross Bro's Paint and Grain Mills, Williamsburgh, N. Y.

Male and Female Agents Wanted—100 per Cent. Profit. Address, with Stamp, for particulars, P. O. Drawer 217, Buffalo, N. Y.

For Sale, two Patents. Address H. S. Ball, Spartanburg, S. C.

Dobson's Patent Scroll Saws make 1100 strokes per minute. Satisfaction guaranteed. John B. Schenck's Sons, 113 Liberty St., N. Y.

Diamonds and Carbon turned and shaped for Philosophical and Mechanical purposes, also Glazier's Diamonds, manufactured and set by J. Dickinson, 64 Nassau St., New York.

Permanent Photograph Printing, just what is wanted by Manufacturers. Send for Circular and specimens to Amer. Photo Relief Printing Co., 1002 Arch St. Philadelphia, Pa. John Carbutt, Sup't.

Boston Fire! Goodnow & Wightman, 23 Cornhill, were not burned out, and are ready to fill all orders for Tools and Materials. Catalogues were all burned, but will have more in about two weeks.

The Berryman Manuf. Co. make a specialty of the economy and safety in working Steam Boilers. I. B. Davis & Co., Hartford, Conn.

First Class Steam and Vacuum Gauges, Engine Registers, Davis' Recording Gauges. New York Steam Gauge Co., 46 Cortlandt St., N. Y.

Peck's Patent Drop Press. For circulars, address the sole manufacturers, M. H. Peck & Co., New Haven, Conn.

Four Brick Machines, Combined with Steam Power (Winn's patent), makes 40 M. per day, for sale at a bargain. Address the manufacturers, John Cooper and Co., Mount Vernon, Ohio.

Absolutely the best protection against Fire—Babcock Extinction. F. W. Farwell, Secretary, 407 Broadway, New York.

Hydraulic Jacks and Presses—Second Hand Plug Tobacco Machinery. Address E. Lyon, 170 Grand St., New York.

Steel Castings "To Pattern," from ten pounds upward, can be forged and tempered. Address Collins & Co., No. 212 Water St., N. Y.

Heydrick's Traction Engine and Steam Plow, capable of ascending grades of 1 foot in 3 with perfect ease. For circular and information Address W. H. Heydrick, Chestnut Hill, Phila.

The Berryman Steam Trap excels all others. The best is always the cheapest. Address I. B. Davis & Co., Hartford, Conn.

T. R. Bailey & Vail, Lockport, N. Y., Manf. Gauge Lathes.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1829.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Army, 301 and 303 Cherry Street, Philadelphia, Pa.

Boydton's Lightning Saws. The genuine \$500 challenge will cut five times as fast as an ax. A six foot cross cut and buck saw, \$6. E. M. Boydton, 80 Beckman Street, New York, Sole Proprietor.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Brown's Coal Yard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro., 114 Water St., N. Y. For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 115 to 121 Plymouth St., Brooklyn. Send for Catalogue.

Mining, Wrecking, Pumping, Road, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Presses, Dies & all can tools Ferracute Mch. Wks. Bridgeton, N. J.

Mackinists; Illustrated Catalogue of all kinds of small Tools and Materials sent free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Gatling guns, that fire 400 shots per minute, with a range of over 1,000 yards, and which weigh only 125 pounds, are now being made at Colt's Armory, Hartford, Conn.

A New Machine for boring Pulleys, Gears, Spiders, etc. etc. No limit to capacity. T. R. Bailey & Vail, Lockport, N. Y.

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co.

Notes & Queries

[We herewith present a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—How can I melt, for recasting, gum elastic?—D. K. N.

2.—How can I temper steel moldboards for plows, so that they will not spring in the process?—D. C. B.

3.—How can water be drawn about 400 feet horizontally and 60 feet up a river bank? There is no chance to put a pump in.—H. & B.

4.—Will some one give me full directions for making a hand rifling machine for gun twist?—M.

5.—Can any one inform me of anything that will remove ink stains from paper without leaving other stains?—W. H. S.

6.—What is the cause of some dead wood burning into cinders, and is it a common occurrence? It has a close resemblance to that which we see at a blacksmith's furnace where common bituminous coal is burnt.—J. N. S.

7.—I have heard that a large manufacturer of builders' hardware finishes with a brown "dip" that does not require baking. It is kept a secret. Can any reader give me a clue to the ingredients of that dip?—R. S. B.

8.—Could not a house be built much cheaper in the form of a square or oblong, than by following the plan given in your paper for November 9? And, if the roof was nearly flat, would not the chambers be cooler in the summer and warmer in the winter?—E. E. S.

9.—I hear many complaints of Wishataw oil stones being too hard. Will not some one inform me of the best method of improving the grit or softening such stones?—J. H. Z.

12.—Owing to the frost getting into the iron of my engine I found it quite rusty. I have removed the rust, but cannot remove the stains. Will some one tell me how I can do it?—P. P.



SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at \$1.50 a line, under the head of "Business and Personal."

ALL references to back numbers must be by volume and page.

J. J. F., of Texas, says: Enclosed please find a small piece of ore. What it is we are unable to tell. Answer: It is pyrites or bisulphuret of iron, not available as an ore.

W. S. N. asks: What is the process of giving to small wires the same point that is put on hair pins? Answer: They are generally pointed by grinding by contact with revolving grinding or milling wheels.

M. asks: Can iron be incorporated with a hair dressing? Is it harmless? Also, will sulphur prevent hair from turning gray? Answer: Preparations of iron and sulphur are used in hair dressings to blacken the hair. These substances probably injure the hair, but are not poisonous like the lead preparations so commonly used in hair dyes. The use of sulphur does not prevent gray hair, but helps to disguise the gray.

P. B. W., of N. J., says: Enclosed is a mineral which I think is amber. I send it to you for inspection. Is it of any value? The vein is all just like the piece that I send you; at first it was about six inches thick, and after digging three feet it was eighteen inches. The vein lays between slate rock. Answer: The specimen is an ochery oxide of iron or "umber" so called, and doubtless would make a useful pigment.

C. B., of Mich., says: I send you herewith three mineral specimens from Kansas. No. 1. Is the magnesian limestone, and I am requested to inquire in regard to its suitability for building a dam. Will it stand the action of the water? No. 2. What is it, what kind of rock and what is it good for? As to No. 3, the questions are, what is it, what is it good for, and is it valuable? If so, what is its value? Answer: (1.) In our opinion is too soft for the purpose stated, and would not endure the wear of the water like the more compact limestones and tough quartz rocks. (2.) Is calcareous marl, the "chalk" of America. (3.) Is ferruginous clay, of the same value as any other clay.

J. E. E. says: The enclosed mineral sample was sent to me some time ago from Arizona, and was described as a specimen of white topaz. I am of opinion that it is nothing more than quartz crystal in a molten state. It cuts glass very readily, as you will perceive. Answer: The mineral is chalcedony, a variety of quartz. Topaz is a third heavier, and is harder.

H. B. H. says: Will you please inform me of the compositions and materials used in filling in between the outside and inside lining of safes? Also state the per cent of water contained in each ingredient that the above composition is made of. Answer: Different safe makers use different filling materials. Ordinary hydraulic cement is a very common filling. Plaster of Paris is another. Plaster and alum another. The amount of water in the filling varies from 20 to 30 per cent of the space occupied by the filling.

J. M. S. says: If the levers of a horse power are lengthened so that the ends, instead of being fastened in the center of drive or bull wheel, pass on and are fastened on edge of said wheel, will there be power gained or not? My friend (who, by the way, is a subscriber to your paper) maintains that the power applied to the side of the wheel nearest the horses is the same in either case, and therefore, the lever being fastened on the opposite side of wheel, all the power there applied is gained. I, on the contrary, maintain that there is no power gained whatever, as the increased distance between the fulcrum and weight, I suppose you might say, will exactly counterbalance the amount of power applied to the side of wheel opposite to that on which the horses are hitched. Answer: The use of levers does not in any case increase the amount of power applied. Levers are simply tools by means of which the power is employed, directed, or expended. In the case of a common lever horse power machine, the longer the levers are, or, in other words, the further their outer extremities extend beyond the center of the wheel, the more easily but more slowly the wheel will be turned.

E. S. C. asks: What per centage of water is returned to the boiler by a condensing apparatus, and how many gallons of water would suffice a 40 horse power boiler, for 12 hours, with a condensing attachment? Answer: The condensing engine requires from 15 to 35 times as great a quantity of condensing water as of feed for the boilers. Each pound of steam condensed yields to the condensing water something over 1,000 units of heat. Each pound of condensing water carries away from 30 to 70 thermal units, this quantity varying with the temperature of the injection water and the condition and management of the condenser. Probably four per cent of the condensing water, as an average, goes back to the boiler as feed with the ordinary condenser. A fair 40 horse power boiler should evaporate 15,000 pounds of water in twelve hours, and would require its engine to be supplied, probably with at least 4,000 gallons of condensing water per hour in summer, and 3,500 in winter.

P. M. says: How can I ascertain the loss by radiation from an exposed boiler front, with steam at 70 lbs. by the gauge? If possible let me know before the middle of January, as it will do no good after that date; a case at law is involved. Answer: To determine approximately the loss by radiation from a metallic surface heated and exposed to the air, the temperature of the air and of the metal remaining constant: 1st. The loss or gain of heat, of a body so exposed, is proportional to the difference between its temperature and that of the surrounding atmosphere up to a limit which is, by some authorities, assumed at a difference of 50 or 60 degrees Fah. Where the difference is greater, a correction is required for accurate work. 2d. Multiply this difference in temperature, in the case observed, by the area in square feet and by 0.3. The product will be the number of units of heat lost. Consult Peclet's "Traité de la Chaleur," p. 373, Paris, 1859, et seq., for further information, and call in an expert of known intelligence and integrity if anything further is needed.

J. E. W. says: A dispute has arisen between us in regard to the speed of steam boats, which we respectfully refer to you for a decision. The question is, simply: At what rate of speed per hour can still

water be displaced? And is there not a limit beyond which water cannot be displaced, notwithstanding the force that may be used; that is, can a steamboat be driven through still water at a rate exceeding 19 miles per hour? Another question is: Can a tapering log 40 feet long (2 inches diameter at one end, and 40 inches at the other), be towed through the water faster with the sharp end, than with the blunt end, foremost? The reason assigned in favor of the blunt end is that it encounters resistance only at one place as it enters the water, and nowhere else; whereas the sharp end encounters resistance at the point all along the log and then drags dead water after it. Answer: There is no known limit to the displacement of water by the suitable application of power. Some of our North river steamboats have made from 22 to 25 miles an hour in still water. Such a log as you describe will tow easier sharp end foremost. It takes but little power to displace water. To push it sideways is like moving a pendulum, and requires little more power than does a pendulum. The principal resistance encountered by well formed vessels in moving through the water is due to the friction of the water on the surfaces of the vessels. Blunt vessels lift more water up in front, and are therefore harder to move than sharp vessels, at same speed.

A constant reader asks:—Will a one inch perpendicular pipe filled with water and inserted in a barrel filled with water, the pipe being twenty-five feet high, have the same pressure as a two inch pipe of the same length; and if not, what would be the difference in pressure? Answer: The pressure will be the same in both cases.

W. McD., of Ohio, says:—The proprietors of the planing mill in which I work thought they could heat the carpenter shop from the exhaust steam from the engine. The size of the boiler is 30 feet long, 40 inches diameter, with two return flues. They had a galvanized iron pipe put in 6 inches in diameter, the iron being about one sixteenth of an inch thick, leading from the engine through the room (about 20 feet), then in to a drum at the top. The drum is 20 inches in diameter and 4 feet long. A 4 inch pipe leads from the bottom of the drum to the outside. The heat it gives off is just perceptible when we hold our hands or faces very close to the pipes or drum. Why does it not afford more heat, and what would be the best remedy? Answer: The temperature of your exhaust steam is probably but little above 212° Fah., and the exposed surface of the pipe is of too limited area to heat what we presume to be a room difficult to warm where the source of heat has so low a temperature. Put a lightly loaded valve on the discharging end of the heating pipe, or else draw steam direct from the boiler. Probably the latter method would be best.

J. G. Says:—I am building a large ice house, 100 feet square, over larger beer cellars; the joists used across the walls are oak, 6 X 12 inches, 20 feet in length, 20 inches apart; a 2 inch strip is nailed on the lower edge of each joist to support a 10 inch pine board between. I now propose to tar those joists all over, together with the board, with hot tar. I then want to fill between the joists, level with the top of each, with something that will not injure or rot the wood. I can get coal ashes from the salt works that are impregnated more or less with salt; or I can get saw dust or tan bark. The object in filling between joists is to protect the ice from exposure below. A floor is then laid over the whole, this is felted and tarred, and made water tight, similar to a roof; a rack is then placed on this floor to receive the ice, which will be from 12 to 15 feet thick. Owing to the immense weights those joists have to carry, it becomes necessary that the filling should be something that will not rot the timber very soon. Now which of the three, ashes, saw dust, or tan bark, would you advise? Answer: Your ashes, containing salt, will be certain to absorb moisture rapidly, and the weight and increased conductivity of heat consequent will be seriously objectionable. The sawdust, if perfectly dry at first, and if it can be kept dry, would be probably best as it is light, an excellent non-conductor, easily handled, and cheap. If, and we presume it will be the case, there is a probability that the filling around your ice house is likely to get moistened from exterior or interior, or both, we should advise tan bark. It is a good non-conductor, not liable to heat in consequence of dampness where the ice is removed, and the tannin remaining in the bark will be a good preservative of the woodwork in contact with it.

Seneca says:—I have had a dispute with a learned friend, and he will be ruled by your decision. He has a windmill on his farm, and uses the power to pump; I remarked that the rod, working perpendicularly, stopped at every revolution of the wheel; he says that as the rod takes its movement from a circular motion (the wind wheel), there can be no stoppage at all as long as the wheel turns. Please state how the matter stands. Answer: There is a cessation of motion at either end of the throw of the crank, but it is of indefinitely short duration. The period of rest is inappreciable and immeasurable by finite power. Seneca and his friend are approaching too closely the misty regions of metaphysics.

An old subscriber writes us to state the names of some cheap liquids, not of an oily character, which are not frozen by our coldest winters, and also please state if there is any chemical which will unite with water and form a compound not easily frozen. Answer: Pure alcohol, ether, bisulphide of carbon, and glycerin do not freeze at any temperature to which they have ever yet been subjected. Ammonia freezes at about 45° below Fahr. zero, and pure nitric acid at about the same point. Mercury freezes at -39° Fahr., sulphuric acid and some other substances require also a temperature far below the zero of Fahrenheit scale to produce solidification. The union of any liquid, which itself remains fluid at a very low temperature, with water will raise its freezing point. Experiment will best determine what liquids and what proportions will answer the purpose.



R. and W. say:—R affirms that a balance or fly wheel if in standing balance or each side of equal weight need not be at right angles to the shaft, to run fast without affecting the steadiness of the shaft. Also that it may be keyed on at even 45° to the shaft without affecting it, except so far as the air may do so, as shown in the engraving; W. asserting the contrary. The one mistaken is to pay five years subscription to your paper for the benefit of him whose premises prove correct. Answer: If a balance wheel is accurately balanced and is perfectly symmetrical in form, and if it is keyed firmly on its shaft in any position except with its plane at right angles to the line of the shaft, it will always tend to turn itself until its axis shall coincide with the center line of the shaft. This effort will be a constant one, tending to bend the shaft but does not necessarily produce unsteadiness in the shaft, as will be readily seen if the experiment be tried. R. is right. We shall be happy to settle many controversies like the above, on the same conditions. The loser certainly does the handsome thing in supplying the SCIENTIFIC AMERICAN for five years to his friend.

I was troubled with angle worms in my well, as "E. L." was with his, until I had a wood house built over it.—S. B., of Conn.

Keep the fur or woolen articles in paper boxes; paste a strip of paper joining the box and cover tightly. It is not possible for the moths' eggs to be laid through paper.—R. S. B., of Conn.

J. W. C. query 4, page 345, can silver brass by dissolving one ounce nitrate of silver, and two ounces cyanuret of potassa, in twenty ounces distilled water; let it stand until clear, then pour it in half ounce phials, each being two thirds full of Paris white; apply with a brush, and polish with a soft cloth.—F. S. B., of Me.

To T. J. S., query 26, page 314.—You may bleach broom corn in a solution of sulphurous acid gas (produced by burning roll sulphur) in water at a temperature of from 70° to 80° Fah.—A. O.

A. G., Jr., query 7, page 345, should learn the art of lithography, as, without a knowledge of it, all experiments in photolithography or photolithography must fail. Lithographic printing ink is used.—W. N., of N. Y.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure, the receipt of original papers and contributions upon the following subjects:

- On Cheap Microscopes. By T. B.
- On the Transmission of Motion. By L. S.
- On a Method of Conveying Water to the Roofs of Buildings in Case of Fire. By W. C.
- On Queer Freaks of a Leyden Jar. By N. E. F.
- On a Premium Acre of Corn. By W. R. S.
- On a Method of Constructing Cheap Fireproof Safes. By B.
- On the Prevention of Fires. By W. C. D.
- On Ball Lightning. By H. B. S.
- On Marine Life Saving Inventions. By J. A. A.
- On the Origin of Storms. By J. H.
- On the Modern Atomic Theory. By R. D. W.
- On the Formation of an Association to Assist and Encourage Inventors. By R. H. T.
- On the Effect of Lightning upon Trees. By J. C. S.
- On What Constitutes Credible Testimony in Regard to Scientific Questions. By J. H. P.
- On Religion and Sciences. By J. F.
- On Milk Sickness. By O. S. M.
- On the Manufacture of Cotton Goods at the South. By E. J. C. W.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

MEDICATED CONFECTION.—Nicholas Saltabassi, New York city.—This invention relates to a new and useful improvement in the line of confections, medicated in such a manner as to make it not only pleasant to the taste, but valuable as a promoter of digestion and a strengthener of weak digestive organs. It consists of equal quantities of grapes and Zante currants reduced to a pulp by heating, pressing, or macerating, or in any manner to form a homogeneous mass. The seeds and skins are then separated therefrom by straining or filtering, and the pulp reduced to a semi-liquid state. Equal quantities by weight of Mocha aloes and camomile flowers in the proportion of about one ounce of the extract to one pound of the above described pulp or sirup are then added. Before cooling, the composition may be run into "drops," and before or after cooling it may be divided into pieces of any form convenient for use, after which it is put up into boxes or packages for sale. Other ingredients, in addition to those named, may be added to give the confection any desired flavor.

STEREOSCOPE.—Antonio Quirolo, New York city.—This invention relates to stereoscopes, and consists in a jointed handle permanently attached to the instrument and made attachable to a fixed standard, whereby the instrument is thus supported in the desired manner without requiring the handle to be detached.

ANIMAL TRAP.—George Barr, Clatskanie, Oregon.—This invention has for its object to furnish an improved trap for catching and destroying mice, rats, squirrels, gophers, minks, etc., and it consists in a combination of springs, levers, and wheels whereby, on touching the bait, the animal is killed, and the trap automatically resets itself.

CEMENT.—William McKay, Ottawa, Canada.—To produce a hard, durable, and quickly setting cement the inventor makes a compound of marl or oyster shells, clay, road dust, wood or coal ashes (or equivalent alkalies), sand, soluble or other glass, or any one or more of the efficacious ingredients, any one or more of the metallic oxides, carbonate of magnesia, or calcined magnesian rock. All the above mentioned ingredients, with the exception of soluble glass and ashes or alkalies, are mixed together with water and ground to a powder in a mortar mill or by any convenient process, after which the whole is brought to a liquid state by the addition of water. The compound is then run into tanks and left to precipitate. When the precipitation has taken place, the excess of water is withdrawn, and the ashes or alkalies are added and thoroughly mixed and incorporated with the compound. The whole is then dried either by artificial heat or in the open air, after which it is thoroughly calcined and ground to an impalpable powder in a flour mill or by any other process. The soluble glass, previously powdered, is then added and incorporated with the compound, which is ready for use in the same manner as other hydraulic or plastic cements.

OIL CAKE TRIMMER.—Washington Hawes, Port Richmond, N. Y.—This invention consists of an endless cutter and a press clamp with a table for holding the oil cake and suitable apparatus for working the cutter and clamp, arranged in such manner that one or more cakes placed on the table under the clamp may be trimmed completely all around the edges at one operation of the cutter. This invention also consists of a receiver for the trimmings and breaking apparatus combined with the trimmer, and adapted to break and pulverize them for being worked over again.

MACHINE FOR MAKING BUNGS.—Charles Abel, Morrisania, N. Y.—This invention relates to a machine for manufacturing bungs for barrels and kegs and for similar purposes, and consists in a revolving tube, through which the timber is automatically fed in a movable tapering cutter head and spindle. When the bung has been turned and tapered a saw is brought down by a lever and the bung is cut off, and at the same time a burr bevels the corner of its large end. The operations of sawing off and beveling the corner are simultaneously performed.

HAY LOADER.—Anthony Garver, Line Spring Station, Iowa.—This invention has for its object to furnish an improved device for loading loose grain, hay, etc., upon a wagon rack which shall be so constructed as to enable the loading to be done easily and rapidly, thus avoiding the necessity of binding the grain, and thereby greatly diminishing the labor and expense of harvesting. As the wagon is drawn forward, the loose grain or hay is gathered by the fingers or teeth, up which and up the platform it is assisted by the rake with his rake. As the grain or hay passes upon the rack, it is received and arranged by the loader. A lever extends up in such a position that it may be conveniently reached by the operator to raise the fingers from the ground in passing obstructions, etc. When the load has been completed the device is detached and left in the field, or attached to a second wagon while the first is being unloaded.

FLOUR BOLT.—John W. Johnson, Evansport, Ohio.—This invention consists of a reel with spiral ribs inside of the ordinary longitudinal ribs, the former arranged as wide apart as the width of a strip of bolting cloth, and the cloth arranged spirally on said ribs and nailed upon the inside.

CARTRIDGE BOX.—Polydore S. Thomson and Frank M. Thomson, of Hudson city, N. J.—The object of this invention is to make cheaper boxes and provide a better and more convenient arrangement of the cartridges; also to increase the capacity of the box. It is a cartridge box consisting of a wooden block having holes of the same length as the cartridges to be inserted, and any elastic perforated sheet, both covered completely by the leather body and all arranged compactly together.

FURROW STAFF.—George H. Comer, of Indiana, Canada.—The object of this invention is to provide a simple and practical instrument for determining the depth of furrows in millstones, so as to insure their equal depth throughout. The invention consists in the arrangement of a sort of sled, carrying a vertically adjustable furrow staff, which, in use, is pushed to show the more elevated portions of the furrow by leaving paint thereon.

EARTH CLOSET.—Henry Clark, Baltimore, Md.—The invention consists first, in providing the vibratory shaft of an earth closet hopper valve with a spring-retracted horizontal rod. It consists, secondly, in the peculiar construction and arrangement of a lock bar and catch in connection with the hopper. The case of the earth closet is made in the form of a washstand or bureau. The lower part of the front of the case is made in one piece, is hinged at its lower edge to the forward edge of the bottom of said case, and has cleats attached to its inner side to serve as ways or guides to the receiver when being drawn out and pushed in. The lower or small hopper is supported from the case in such a position that its bottom may be just above the receiver when said receiver is pushed in, and the discharge-opening of the said hopper directly above the opening in the top of said receiver, so that the earth from the said hopper may pass directly into the said receiver. The discharge opening of the hopper is closed by the door or valve, which may be closed and opened by turning a shaft. This shaft is connected with a rod which projects at the forward side of the case in such a position that the door, when closed, will strike against it and force it back, opening the valve and allowing the earth in the hopper to fall into the receiver. The discharge-opening in the bottom of the upper hopper is closed by a door or plate, so that when the said hopper is fully pushed back the said discharge opening will be closed, and when the hopper is drawn forward a little way the discharge-opening will be opened sufficiently to allow a small quantity of earth to pass down into the small hopper. The hopper has a bar so arranged as to draw it forward to supply the small hopper with earth by opening the door.

EYE GLASS.—Lucius B. Winslow, of New York city.—This invention consists in so forming the joints of the glass bows and arranging the connecting spring therewith that the screw for fastening the ends of the bow and securing the glass also fastens the spring to the bow, and holds it so that it can be adjusted to lengthen or shorten it and thereby vary its tension.

CAR COUPLING.—Robert Nelsch and Charles G. Hirner, of Allentown, Pa.—This invention has for its object to furnish an improved car coupling so constructed as to couple automatically as the cars are run together, even though the cars to be coupled should differ in height, and which may readily be so adjusted that the cars will uncouple as they are drawn apart. A block or heavy plate is inserted in a seat in the frame work of the car, to which it is secured by bolts which pass through slots. Rubber springs, inserted between the inner edge of the block and the edge or shoulder of the frame work, are designed to diminish the shock when the cars are run together. As the cars are run together, the end of the coupling link enters one or other of the spaces between the plates, according to the height of the adjacent car, and pushes back a lever, which allows the coupling pin to drop into place. By pressing down one end of a lever the movable parts of the coupling may be raised into place, and by pressing upon the other end the said parts may be lowered, releasing the lower end of the coupling pin so that the coupling link may be drawn from said pin as the cars are drawn apart, the hole in the block through which the pin passes being elongated into a slot to allow the lower end of the said coupling pin to be drawn outward. The pin is held in place in the forward end of said slot by a spring, placed in its inner end, and which is so formed as to be compressed and allow the pin to take an inclined position when its lower end is released and drawn outward. The lever may be placed beneath the frame if desired, in which case it should have rods pivoted to its ends and passing up through the said frame, so that the lever may be conveniently operated by the brakeman with his foot.

SMUT MACHINE.—George W. Grant, Middleport, Ohio.—This invention consists of certain novel combinations and arrangements of screening, separating, scouring, and fan-blowing apparatus. The hopper has a bottom composed of wires extending from the rear to the front, and diverging so that the spaces increase in width toward the front. Said spaces at the rear are too close together to let the grain fall, for allowing the sand and other small matters to escape to the spout below and be discharged through it, the coarse matters passing off at the front escape through a spout. The rear end of the hopper is arranged in the concave form shown, for breaking the force of the grain discharged against it, and a short distance in front of this back is a valve, which is swung up by the flowing grain in passing along the wires. This valve has longitudinal grooves in the side against which the grain comes, which grooves are designed to so act on the straws, sticks, and other matters having considerable length, as to turn them at right angles to the wires before letting them pass, to prevent them from falling through the wires. Along the middle portion of the bottom the grain falls through, between adjustable gates, into the hopper below. At the lower end of the bottom of this hopper is a gate which checks the descent of the grain and causes it to fall in a thin even stream through the space of the upper portion of the separator to the space below, to be exposed in such fall to a blast of air by a fan, to deflect the lighter grains and other matters inward to be separated into two grades by gates, which may be shifted to vary or regulate the separation. The first grade, consisting of the heavy grain, falls on the deflector, and is thereby chuted into the sides and bottom of the hopper, from which it is conducted to the scouring frame. The second grade falling between the gates passes into the oats and cockle separator, consisting of the concave metal plate and the wire brush or cushion wheel. The brush will have a slow rotary motion. From between the scouring devices the grain passes out into the case, between the blades, to the scouring action of which it is subjected for a considerable time, and is then forced up by them to the deflectors, where it is again subjected to a blast to have the scoured off light matters blown away; thence it passes out through the spout.

ENGRAVING AND CARVING MACHINE.—Thomas W. Winter, New York city.—This invention relates to a new machine for engraving and carving, die sinking, cameo and intaglio cutting, and similar fine and delicate work, in stone, steel, or other material, with the object of enabling the exact and artistic imitation of suitable designs. It consists, first, in fastening the engraving or carving tool in a spindle which hangs on a vibrating beam, said beam being also provided with the feeling or pattern pin. The chief novelty in this feature is in fastening the tool in a spindle which hangs horizontally on the beam, and in revolving said spindle by belt connection the same as a lathe spindle, so that the tool can be used to the very same advantage as that to which it is at present used on the lathe only. The next feature of novelty consists in fastening the pattern and the article to be cut upon platforms which can be tilted into a suitable inclined position. The tool can thereby be made to work at any suitable angle on the material to be cut, and consequently to incisions of all kinds, not only straight up and down, as in the present engraving machines, but also inclined, rounded, etc., as may be necessary for the making of reliefs for cameos or depressions for intaglios. The mechanism for thus inclining the pattern and the work is so united that both will be moved in exactly the same degree and offer the same angle of surface to the feeling pin and cutter respectively. This tilting motion is effected by worm wheel segments applied to the supporting platforms of the pattern and work, and matching both into the thread of a screw, which, when turned, inclines them. Furthermore, the invention consists in making and applying disks to the aforementioned platform which are jointly rotating and longitudinally adjustable in equal degree, and in providing the nuts that embrace the longitudinally adjusting screw, jointed to permit their being placed at suitable distances apart. Finally, the invention consists in hanging the screw which causes the joint rotation of the platforms in vertically sliding boxes, so that it will accommodate itself automatically to the greater or less height of the platforms during their tilting motions.

PAPER CUTTING MACHINE.—Edwin R. Sheridan and Theodore W. Sheridan, New York city.—This invention has for its object to improve the construction of paper cutting machines. The knife bar and knife are moved up and down by the movements of the lever, which is connected with said knife bar by an adjustable connecting rod. The lever is pivoted and works in a guide slot in the lower part of the frame. To the end of the lever is attached the lower end of a chain, the upper end of which is attached to the shaft or to a drum placed upon and secured to said shaft. In the shaft or drum is formed a spiral groove into which the chain is wound as the shaft or drum is revolved in one direction, so as to raise the lever and draw the knife bar and knife down upon the paper to make a cut. The spiral groove in the shaft or drum keeps the coils of the chain parallel with each other, and thus prevents the coils overlapping and the chain from kinking while being wound and unwound, so that the movement of the knife may be steady and uniform. A block moves up and down loosely in grooves or ways in the frame and guide block, and is so formed that as the lever approaches the up

per limit of its stroke it may strike against and raise the said block. The upper end of the block is inclined so that, as it is raised by the lever, it may move the free end of the lever outward, and thus allow the lever to descend by its own weight, raising the knife bar and knife to make another cut. The lever should have an adjustable weight attached to it, to enable its rapidly of descent to be regulated as desired. As the lever approaches the limit of its downward movement it strikes a spring attached to the lower part of the lever, which checks it, prevents rebound, and at the same time moves a second lever which is pivoted to the frame, and its upper end is connected with one end of the brake band or strap, which passes over the hub of the gear wheel, or a brake wheel attached to said gear wheel, so that the first lever as it reaches the lowest point of its descent, may apply the brake and stop the movement of the gear wheels, until motion is again given by throwing a clutch into gear.

GANG PLOW.—Joseph Lane, Eugene, Ind.—This invention consists in certain improvements in gang plows in which the plows are adjustably pivoted to the supporting frame, and connecting rods are used for connecting the plow beams with the eveners, so that the draft on the eveners forces the points in the ground and keeps them in; and one or more of the plows may be kept out of work while the others are at work, or some may be worked deeper than others, and all may be adjusted higher or lower; and in which rolling cutters for cutting the sod, and a gage wheel for regulating the depth of cut and for supporting the weight at the front of the axle so as to take it off the horses, is used.

POTATO DIGGER.—Robert G. Dayton, North Granville, N. Y.—By suitable mechanism a shaft is actuated by the wheels, which revolve upon the journals of the axle. To the shaft are attached spur or chain wheels, around which passes the endless carrier, which also passes around spur or chain wheels attached to another shaft, that revolves in bearings in the lower forward part of the scoop flanges a little below and in the rear of the rear edge of the scoop. The carrier is formed of slats hinged to each other at their edges, and having flanges formed upon their lower edges to carry up the soil and potatoes more surely. From the carrier the potatoes and soil fall upon the shaker, through which the soil passes, and from the rear end of which the potatoes fall to the ground. By suitable construction the shaker is moved both laterally and longitudinally as the machine is drawn forward. A plate or apron is placed upon the forward part of the shaker in such a position as to receive the soil and potatoes from the carrier. The apron is held in position by rods, the lower ends of which are attached to the ends of the said apron, and the upper ends of which are connected with the carrier shaft, so as to keep the said apron always in the same position with respect to the rear end of the carrier.

EARTH AUGER.—Thomas C. Harris, Dresden Deep River, Iowa, assignor to himself and Amos Taylor, of same place.—This invention comprises certain improvements in the construction of the augers of well boring apparatus. The inventor proposes to make a large portion of the disk in front of each lip of this spring steel plate, and attach said parts to the thicker parts rigidly, by riveting them or otherwise, by which a much more efficient and durable, as well as cheaper, arrangement is obtained than that in which the corresponding parts of thick and strong metal are hinged to the parts. In this case the spring plates yield sufficiently to allow the large stones to pass up with the earth raised by the bits, and they return to and retain their position for holding the earth when the auger is lifted out of the well much better than the hinged parts. These plates are curved inward and attached to the inner sides of the braces, so that the earth forced back on the auger will pass and not obstruct the turning of the auger, as it would if allowed to come against the front of said braces. These braces are made of cast-iron or other like tubing, and the disk has holes where they are attached, so that air can flow down under the auger to prevent the forming of a vacuum below when the auger is raised; and below these holes the bow shaped spring cap plates are placed, so that they can slide back and forth as said caps spring up to the disk, when the auger is boring, to close the holes and protect them from clogging, and spring away again to open the holes and admit the air as soon as the auger is slightly lifted.

BRIDGE.—Hamlin G. Russell, of Lincoln, Ill.—The invention consists in arranging the bridge floor so as to leave a space between it and the lower chords, and so as to be below, or in the same horizontal plane with, the under side of said chords. It also consists in the arrangement of vertical tie bolts or rods, with the braces, cross beams, and chords, whereby a strong and durable yet comparatively light and inexpensive bridge skeleton is formed.

LATHE DOG.—Lorenzo P. Whiting, of Poughkeepsie, N. Y.—The object of this invention is to provide convenient means for holding bolts which it is necessary to turn, as in steam engine work, locomotives, and other nice pieces of machinery; and it consists in an adjustable dog in which each jaw is acted upon by a separate rib or scroll, and the ribs are placed at an angle which moves the jaws very quickly and saves time. The scroll plate is held to its place by the center plate, which is fastened to a stationary plate. The scroll plate is rabbeted for the center plate. By means of screws the dog is attached to the face-plate of the lathe, and by suitable means it may be adjusted to any distance from the face or side of the face plate, according to the length of the center in the lathe spindle. An orifice is provided through the plate, through which the center passes, and is allowed to come in contact with the bolt head with the point or center of the lathe.

[OFFICIAL]

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FOR THE WEEK ENDING NOVEMBER 19, 1872, AND EACH BEARING THAT DATE.

SCHEDULE OF PATENT FEES:

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On each Trade-Mark.....	\$25
On filing each application for a Patent (seventeen years).....	\$15
On issuing each original Patent.....	\$20
On appeal to Examiners-in-Chief.....	\$10
On appeal to Commissioner of Patents.....	\$20
On application for Reissue.....	\$30
On application for Extension of Patent.....	\$50
On granting the Extension.....	\$50
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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter named.

23,011.—WATER WHEEL.—N. F. Burnham. February 5, 1873.
23,022.—MOLDING STOVE COVEY.—G. W. Gardner. February 5, 1873.
23,022.—STEAM PRESSURE GAGE.—T. W. Lane. February 5, 1873.
23,023.—HOSE COUPLING.—R. B. Lawton, W. H. Bliss. February 5, 1873.
23,040.—LOCKS.—L. F. Munger. February 5, 1873.
23,172.—TICKET PRINTING MACHINE.—R. M. Hoe. February 19, 1873.
23,792.—GAS PIPE CUTTERS.—J. E. Starwood. April 9, 1873.

EXTENSIONS GRANTED.

1,946.—BARREL MACHINERY.—W. Trapp.
1,947.—BARREL MACHINERY.—W. Trapp.
21,129.—BOTTLE MOLD.—J. L. Mason.
29,152.—KETTLE FOR TRYING OIL.—J. L. Alberger.
21,157.—PIPE TONGS.—J. R. Brown.
21,156.—HOSE COUPLING.—J. C. Cooke.
22,114.—DEVICE TO PREVENT RUPTURE OF MAINSPRING.—D. B. Bitts.
22,185.—PRESERVATION OF FLESH.—N. B. Marsh.
21,186.—SCREW NECK BOTTLE.—J. L. Mason.

DISCLAIMERS.

21,129.—BLOWING BOTTLES.—T. L. Mason.

DESIGNS PATENTED.

6,249 & 6,250.—CARPETS.—A. Heald, Philadelphia, Pa.
6,251 to 6,255.—CARPETS.—H. Horan, Newark, N. J.
6,259.—CARPET.—A. M. King, Kidderminster, England.
6,260.—CARPET.—W. Mallinson, Halifax, England.
6,261.—CARPET.—A. Martin, Paris, France.
6,262.—CARPET.—W. McCallum, New York city.
6,263.—CARPET.—E. J. Ney, New York city.
6,264.—SHOE.—D. P. Brown, Reading, Mass.
6,265 to 6,267.—PRINTING TYPES.—James M. Conner, New York city.
6,268.—SLRION BODY.—J. C. Gould, Albany, N. Y.

TRADEMARKS REGISTERED.

1,962.—WATCH KEY.—L. F. English, Springfield, Mass.
1,963.—SHIRT BODICES.—S. Sibley, Boston, Mass.
1,964.—COMPOUND OXYGEN WATER.—G. B. Starkey, Philadelphia, Pa.
1,965.—HARMONICAS.—Strasburger & Pfeiffer, New York city.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From November 8 to November 14, 1872, inclusive.

AIR-HEATING FURNACE.—S. J. Gold, Cornwall, Conn.
BALING PRESS.—P. K. Dederick, New York city.
BOLT AND NUT MACHINERY.—F. S. Alice, C. F. Hitchel, New York city.
BORING AND DRILLING MACHINE.—G. F. Hitchel, F. S. Allen, New York city.
CLEANING COTTON WASTE.—J. H. Post, New York city.
CLEANING GRAIN, ETC.—J. F. Wood, Boston, Mass.; F. F. Skinner, Detroit, Mich.
ELECTRIC TELEGRAPH.—J. B. Stearns, Boston, Mass.
FASTENING WINDOW SHUTTERS.—J. M. Crossman, South Orange, N. J.; G. S. Rice, Tarrytown, N. Y.
FLUID MOTOR.—W. C. Dodge, J. H. E. P., & R. W. Welch, Washington, D. C.
KALEIDOSCOPE.—W. Woodbury, New York city.
LOOM.—J. Lyall, New York city.
PIPE JOINT.—J. F. Ward, Jersey city, N. J.
PRINTING TELEGRAPH.—T. M. Foote, New York city.

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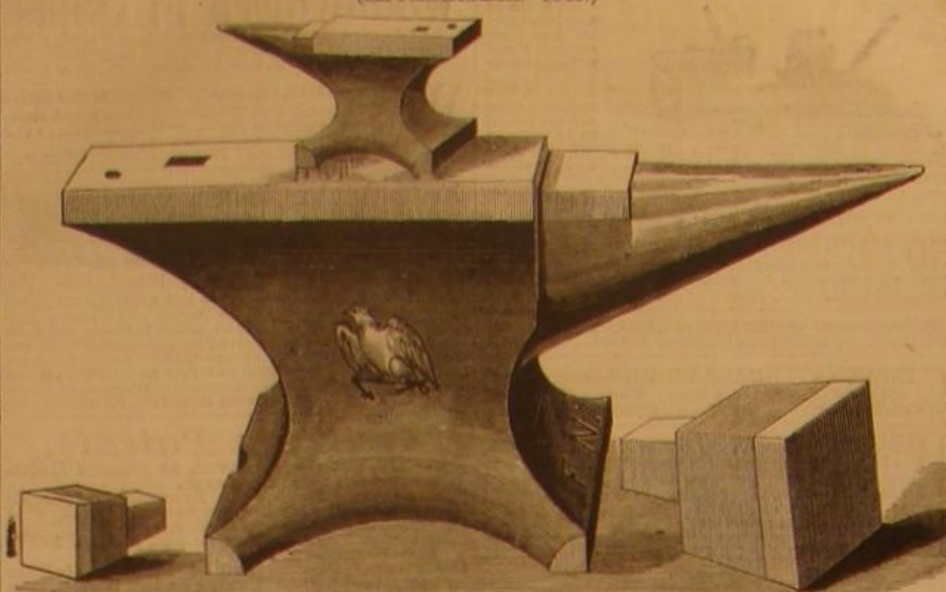
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